VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the **reissuance** of the VPDES permit listed below. This permit is being processed as a **Minor, Municipal** permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et seq. The discharge results from the operation of an advanced domestic sewage wastewater treatment plant. This permit action consists of issuing the permit for a five-year term with limitations on BOD_5, TKN, TSS, pH, DO, ammonia, total recoverable zinc, total recoverable copper, total recoverable nickel, total recoverable antimony, and *E. coli*. A schedule of compliance is included for copper, nickel, and antimony. SIC Code: 4952

1. Facility Name and Address:

   Moneta Regional Wastewater Treatment Plant
   1723 Falling Creek Road
   Bedford, VA 24523

   Location: 1622 White House Road, Moneta, VA 24121

2. **Permit No. VA0091669** Existing Permit Expiration Date: June 16, 2015

3. Owner Contact: Name: Mr. Michael Ramsey Title: Operations Manager
   Bedford Regional Water Authority
   Telephone No: (540) 586-7679 x152

4. Application Complete Date: December 23, 2014
   Permit Drafted By: Lynn V. Wise Date: April 30, 2015
   Blue Ridge Regional Office - Roanoke
   Reviewed By: _Kevin Harlow_____ Date: _______________
   Public Notice Dates: from ___________ to: ________________

5. Receiving Stream Name: Hunting Creek River Mile: 1.17
   Basin: Roanoke River Subbasin: Roanoke River Section: 5a Class: III
   Special Standards: PWS

7-Day, 10-Year Low Flow (7Q10): 0.088 MGD	7Q10 High Flow months: 0.221 MGD
1-Day, 10-Year Low Flow (1Q10): 0.083 MGD	1Q10 High Flow months: 0.196 MGD
30-Day, 5-Year Low Flow (30Q5): 0.143 MGD	Harmonic Mean Flow (HM): 0.425 MGD
30-Day, 10-Year Low Flow (30Q10): 0.107 MGD	30Q10 High Flow months: 0.272 MGD
Tidal? YES/**NO**	On 303(d) list? **YES**/NO

6. Operator License Requirements: Class II

7. Reliability Class: Class I

8. Permit Characterization:
( ) Private ( ) Federal ( ) State (X) POTW ( ) PVOTW
( ) Possible Interstate Effect ( ) Interim Limits in Other Document

9. Provide a brief description of the wastewater treatment system.

Discharge Description

OUTFALL NUMBER	DISCHARGE SOURCE	TREATMENT	FLOW
001	Domestic Sewage from residential and commercial sources	Flow equalization, primary screening/grit removal; fixed film process (biowheels) including denitrification; clarification; filtration; UV disinfection; post aeration; discharge to Hunting Creek	0.5 MGD* (design flow)

The facility began discharging in January of 2007. The treatment plant serves an approximate population of 518. Currently, the average flow rate is approximately 0.061 MGD. A schematic of the plant may be found in **Attachment A.**

10. Sewage Sludge Use or Disposal:

Waste sludge is aerobically digested and dewatered by a belt filter press with final disposal at the Bedford County landfill. At the current flow rate, the process generates approximately 14.3 dry tons of sludge per year.

11. Discharge Location Description: (Please see location map in **Attachment A.**)
Name: Moneta Quadrangle Number: 078A
Latitude: 37° 10' 21.5" N Longitude: 079° 36' 42.1" W

12. Material Storage:

All materials are stored indoors, mainly in the belt filter press building. At the time of the site visit, the materials stored included: approximately 50 50-lb bags soda ash; 1 55-gal drum polymer (used to condition sludge prior to pressing); 50 50-lb bags hydrated lime (generally not used in the process); 1 50-lb bag sweet molasses. Lab supplies/chemicals are stored in the lab.

13. Ambient Water Quality:

The Moneta Regional Wastewater Treatment Plant discharges to Hunting Creek in the Roanoke River Basin at River Mile 1.17. The receiving stream is classified as a Class III Water (Nontidal Waters, Coastal and Piedmont Zones) with a special designation as a Public Water Supply (PWS). (Water Body ID – VAW-L22R) Critical stream flows at the discharge point were determined by drainage area proportions as compared to the continuous record gage on Tinker Creek near

13. Ambient Water Quality (continued):

Daleville, VA (#02055100). The critical flows are listed on the front page of this Fact Sheet. A copy of the Flow Frequency Determination memo may be found in **Attachment B**.

An ambient water quality monitoring station (4AHNT001.29) was established on Hunting Creek at river mile 1.29, approximately one-tenth of a mile upstream of the discharge from the Moneta Regional WWTP. Due to the short period of record at this site, temperature and pH data from nearby Beaverdam Creek (monitoring station 4ABDA003.63) were used for the purposes of calculating wasteload allocations for the discharge. The data from both monitoring stations may be found in **Attachment B**. Please see section 16 for further discussion of effluent limitation evaluation.

Based upon stream data collected at monitoring station 4AHNT001.29, Hunting Creek was added to the 303(d) list of impaired waters in 2010 due to exceedances of the bacteria criteria. The TMDL was nested into the approved TMDL for the Cub Creek, Turnip Creek, Buffalo Creek, Buffalo Creek (UT), and Staunton River Watersheds. Initially, the TMDL did not include an allocation for this facility because it was not on-line when the TMDL was developed. The TMDL was modified to allocate a loading based on the design flow of the facility equivalent to the water quality standard (126 n/100ml). Other downstream impairments include PCBs and mercury in fish tissue resulting in a fish consumption advisory being issued by the Virginia Department of Health. The approved PCB TMDLs for the Roanoke (Staunton) River does not have an allocation for this facility. A TMDL for mercury has not yet been developed. Applicable 2012 Impaired Waters Fact Sheets and excerpts from applicable TMDLs may be found in **Attachment B.**

A review of PReP complaint logs shows that no pollution complaints or incidents were reported that could be attributed to the discharge from the Moneta Regional WWTP.

14. Antidegradation Review & Comments: Tier 1 _____ Tier 2 __**XX**___ Tier 3 _____

The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. Several factors needed to be considered to determine the appropriate tier for Hunting Creek. First, public water supplies are assumed to be Tier 2 unless information is available to indicate otherwise. Hunting Creek is listed on the 303(d) list due to violations of the in-stream water quality criteria for bacteria above the treatment plant discharge; however, agency guidance states that non-attainment of the bacteria criteria should not be used to establish the tier category of a water unless there is clear and convincing evidence that the elevated bacteria numbers are due to inadequately disinfected human waste. Since the impairment has not been attributed to human waste, a Tier 2 designation is appropriate. There are downstream impairments for PCBs and mercury in fish tissue (Roanoke/Staunton River) resulting in a fish consumption advisory being issued by the Virginia Department of Health. Agency guidance also states that fish consumption advisories, bans and prohibitions do not constitute

14. Antidegradation Review & Comments (continued):

grounds for a Tier 1 determination. Based on these findings, Hunting Creek is designated as a **Tier 2** water, and no significant degradation of existing quality is allowed.

For purposes of aquatic life protection, "significant degradation" means that no more that 25% the difference between the acute and chronic aquatic criteria values and the existing quality (unused assimilative capacity) may be allocated. For purposes of human health protection, "significant degradation" means that no more than 10% of the difference between the human health criteria and the existing quality (unused assimilative capacity) may be allocated. The significant degradation baseline (antidegradation baseline) for aquatic life protection is calculated for each pollutant as follows:

0.25 (WQS - existing quality) + existing quality = Antidegradation baseline

The antidegradation baseline for human health protection is calculated for each pollutant as follows:

0.10 (WQS - existing quality) + existing quality = Antidegradation baseline

The "antidegradation baselines" become the new water quality criteria in Tier 2 waters and effluent limits for future expansions or new facilities must be written to maintain the antidegradation baselines for each pollutant.

Effluent limitations are discussed in detail in Section 16 below. The discharge is in compliance with antidegradation requirements set forth in the Water Quality Standard Regulation, 9 VAC 25-260-30. The antidegradation review was conducted as described in Guidance Memorandum 00-2011, dated August 24, 2000, and complies with the antidegradation policy contained in Virginia's Water Quality Standards.

15. Site Visit: Date: May 5, 2015 Performed by: Lynn V. Wise
Please see **Attachment A** for a copy of the site visit report.

16. Effluent Screening & Limitation Development:

A table showing effluent data collected during the current permit term can be found in **Attachment C**. With the exception of zinc, the discharge has generally been in compliance with the effluent limitations. There have been changes in the characteristics of the effluent (pH, temperature, and hardness) that may affect the allowable wasteload allocations for the discharge. Therefore, the effluent limitations for toxic parameters are being re-evaluated to ensure compliance with the current *Water Quality Standards*.

Flow – No limit, monitoring only. The design flow of this facility is 0.5 MGD. A Totalizing, Indicating & Recording sample type is required.

BOD_5, TKN, DO - The limits for these parameters were developed using the agency desktop dissolved oxygen (DO) modeling program. The assumptions and values used in the previous permit reissuance remain valid; as such, the effluent limitations remain unchanged. In accordance with the antidegradation policy for Tier 2 waters, the dissolved oxygen concentration was held to a 0.2 mg/l drop from the background concentration. It was determined that the maximum allowable

16. Effluent Screening & Limitation Development (continued):

30-day average concentrations are 7 mg/l for BOD_5 and 5 mg/l for Total Kjeldahl Nitrogen (TKN). The maximum weekly average concentrations are limited to 10 mg/l for BOD_5 and 7.5 mg/l for TKN. The corresponding mass loading limits are included in the permit. A minimum effluent DO concentration of 7.3 mg/l is also required. A copy of the results of the model is included in **Attachment C**.

It is noted that tiering of BOD limits was considered. However, based the sensitivity of the model to initial mix, the lower temperature of the receiving stream (and thus higher dissolved oxygen concentration) in the high flow months negated the benefits of higher flows. Therefore, tiered limits are not included.

Total Suspended Solids (TSS) - The limits for TSS are set in accordance with Federal Secondary Treatment Regulation (40 CFR Part 133), which requires a monthly average of 30 mg/l, a maximum weekly average of 45 mg/l, and 85% removal. Corresponding mass loading limitations are also included.

pH - The minimum limit of 6.0 and the maximum limit of 9.0 standard units are in accordance with the water quality standards for this water body and the Federal Secondary Treatment Regulation.

Ammonia - The need for an ammonia limit was evaluated based on the acute and chronic in-stream water quality criteria, which were calculated using the 90th percentile pH and temperature of the effluent and of a similar nearby stream during low flow and high flow periods. (Beaverdam Creek was determined to be an appropriate similar stream to estimate the pH and temperature in the receiving stream.)

First, the MIX.EXE program was used to determine the percentage of the receiving stream that could be used for mixing. Then, the criteria and wasteload allocations (WLAs) were calculated (See MSTRANTI spreadsheet printout). In accordance with Guidance Memo 00-2011, a data point of 9.0 mg/l was entered into the STATS.EXE program to determine the need for a limit. This is the agency's best estimate of the expected statistics for ammonia in this type of effluent. The calculations show that a concentration of 0.4 mg/l ammonia-nitrogen is required to protect the chronic in-stream standard during low flow months while a concentration of 0.7 mg/l is required during high flow months (January through May). All supporting calculations and documentation are presented in **Attachment C**. Note that these results are significantly lower than those that were previously calculated due to increases in the pH and temperature of the effluent.

Total Residual Chlorine (TRC) – Not required. Ultraviolet disinfection is used at this facility.

E. coli – The Water Quality Standards (WQS) which became effective on January 15, 2003, included new bacteria standards in 9 VAC 25-260-170.A, as well as the revised disinfection policy of 9 VAC 25-260-170.B. These standards replaced the existing fecal coliform standard and disinfection policy of 9 VAC 25-160-170. A geometric mean of 126 n/100 ml or less must be maintained at this facility.

Other Toxic Parameters – Water Quality Standards monitoring was required during the past permit cycle. Additionally, the permittee contracted for services to determine whether a metals translator study or Water Effect Ratio study would justify higher effluent limitations for zinc or copper, respectively. In order for data to be suitable for evaluation, it must represent the exact material for which a water quality standard has been adopted and some data must be above the respective

16. Effluent Screening & Limitation Development (continued):

quantification level (QL). The only parameters for which there is suitable data are dissolved antimony, dissolved copper, dissolved nickel, and dissolved zinc. Note that the need for limitations for dissolved iron, chlorides, sulfate, and total dissolved solids was evaluated during the previous permit reissuance; no limitations were necessary. A discussion of these parameters can be found below.

Total Recoverable Zinc – The current permit contains limitations for total recoverable zinc. Dissolved zinc data that was collected during the permit term/compliance schedule was re-evaluated to ensure compliance with the water quality standards. Using the results from MIX.EXE and the Water Quality Criteria/Wasteload Allocation Analysis spreadsheet (MSTRANTI.xls), the STATS.EXE program was used to determine whether there is the reasonable potential for the discharge to cause a violation of the Water Quality Standards. It was found that an effluent limitation of 39 μg/l is needed to protect against acute toxicity. In accordance with agency guidance, the limit is expressed as Total Recoverable Zinc, assuming all of the metal is present in the dissolved form (a 1:1 ratio). The permittee contracted to have a metals translator study for zinc. The results show that the total zinc is comprised of 92% dissolved zinc. Therefore, the limit becomes 42 μg/l as a monthly average and a maximum weekly average. This is a slight increase from the current limit of 34 μg/l. Please see section 18 for a discussion of backsliding. All supporting documentation can be found in **Attachment C.**

Total Recoverable Copper – The available dissolved copper data was evaluated to determine whether there is a reasonable potential for the effluent to cause or contribute to an in-stream violation of the water quality standards, including antidegradation. The same procedures as outlined for zinc above, were performed. It was found that a limit of 4.39 μg/l is necessary to protect against chronic toxicity. The permittee contracted to have a Water Effect Ratio (WER) study performed for copper. A WER is a criteria adjustment factor that accounts for the effect of site-specific water characteristics on pollutant bioavailability and toxicity to aquatic life. The results of the study show that the appropriate WER for copper at this facility is 4.096. The limitation becomes 18 μg/l as a monthly average and a maximum weekly average. Available data indicate that the facility is not currently achieving compliance with this limitation; therefore, a compliance schedule is included in this permit.

Total Recoverable Nickel – The available dissolved nickel data was evaluated to determine whether there is a reasonable potential for the effluent to cause or contribute to an in-stream violation of the water quality standards, including antidegradation. The same procedures as outlined for zinc above, were performed. It was found that a limit of 10 μg/l (monthly average and maximum weekly average) is needed to protect against chronic toxicity. While available data indicate the facility may be able to comply with this limitation at this time, nickel is being included in the compliance schedule for copper to allow the permittee opportunity to resolve all metals issues concurrently.

Total Recoverable Antimony – While there are no aquatic life criteria for antimony, there is a public health criterion (5.6 μg/l) to protect against toxic effects through drinking water and fish consumption. A concentration of 0.8 μg/l was reported for dissolved antimony in the effluent. The calculated antidegradation wasteload allocation for this discharge is 0.72 μg/l. Since there is a reasonable potential for the effluent to cause or contribute to an in-stream violation of the criterion, a limit equivalent to the wasteload allocation is included in the permit. A compliance schedule is also included.

16. Effluent Screening & Limitation Development (continued):

Chloride, Sulfate, Total Dissolved Solids, and Iron – The receiving stream is designated as a Public Water Supply (PWS); therefore, Human Health Criteria for PWSs apply. The human heath criteria for these parameters were adopted to maintain acceptable taste, odor, or aesthetic quality of drinking water and they apply at the drinking water intake. Data were reviewed during the last permit reissuance process and none of these parameters were detected above the human health (PWS) criteria. It can therefore be assumed that since the discharge is meeting the criteria at the end of the pipe, the criteria will be met at the drinking water intake. It is noted that the Virginia Department of Health indicated that there are no public water intakes within 15 miles downstream of the discharge. Therefore, no effluent limitations are required. It is noted that there are also aquatic life criteria for chlorides. The effluent data was well below the respective wasteload allocations showing no limitations were needed.

Basis for Effluent Limitations

PARAMETER	BASIS
BOD_5, TKN, DO	2 – dissolved oxygen model, WQS
TSS	1 – Secondary Treatment Regulation (40 CFR 133)
pH	2 – WQS and 1 – Secondary Treatment Regulation (40 CFR 133)
Ammonia	2 – WQS
E coli	2 – WQS
Total Recoverable Zinc, Total Recoverable Copper, Total Recoverable Nickel, Total Recoverable Antimony	2 - WQS

1. Federal Effluent guidelines – cite CFR
2. Water Quality-based Limits: - show calculations or cite WQM plan reference
3. Best Engineering Judgement: - provide narrative rationale
4. Best Professional Judgement: - provide narrative rationale
5. Other (e.g. wasteload allocation model): - specify & document with model output or WLA from TMDL or basin plan

17. Basis for Sludge Use & Disposal Requirements:

Not applicable. Sludge is aerobically digested, dewatered with a belt press, and disposed of in the Bedford County Landfill (DEQ Permit No. 560).

18. Antibacksliding Statement:

The antibacksliding policy prohibits the relaxation of effluent limitations except under certain circumstances. All effluent limitations are at least as stringent as those in the current permit with the exception of total recoverable zinc. The new limits were calculated using effluent and receiving stream data rather than that of a nearby stream. In addition, new information was available from the metals translator study provided by the permittee. Section 402 (o)(2) of the Clean Water Act states that if information is available which was not available at the time of permit issuance and which would have justified the application of a less stringent effluent limitation at the time of permit issuance, it is acceptable to apply the less stringent effluent limitation.

19. Compliance Schedules:

The *VPDES Permit Regulation* allows for the inclusion of Compliance Schedules at 9 VAC 25-31-250. In accordance with Agency guidance, a four-year schedule is being included for Total Recoverable Copper, Total Recoverable Nickel and Total Recoverable Antimony. This will provide the facility sufficient time to provide additional data to show that the limit is not needed or to install any necessary treatment to come into compliance with the newly imposed limits. See Part I.B of the VPDES Permit.

20. Special Conditions:

a. **95% Capacity Reopener**
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 4 for all POTW and PVOTW permits.

b. **Indirect Dischargers**
Rationale Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 1 and B 2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

c. **CTC, CTO Requirement**
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790.

d. **O&M Manual Requirement**
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9VAC25-31-190 E.

e. **Licensed Operator Requirement**
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C and the Code of Virginia § 54.1-2300 et seq, Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators. A Class II operator is required for this facility.

f. **Reliability Class**
Rationale: Required by Sewerage Regulations, 9 VAC 25-60-20 and 40 for all municipal facilities. A Reliability Class I has been designated for this facility. Please see memorandum in **Attachment A** confirming concurrence between DEQ and VDH concerning Reliability Class.

g. **Sludge Reopener**
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C 4 for all permits issued to treatment works treating domestic sewage.

h. **Compliance Reporting**
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when water quality based limitations are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

20. Special Conditions (continued):

i. **Sludge Use and Disposal**
Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

j. **Polychlorinated Biphenyl Compounds Pollutant Minimization Plan**
Rationale: State Water Control Law § 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State Waters and Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. Development of a PCB Total Maximum Daily Load (TMDL) requires consideration of the Virginia water quality criterion for Total PCBs (9 VAC 25-260-140) to protect the "fishable" designated use (9 VAC 25-260-10). In addition, the VPDES Permit Regulation, 9 VAC 25-31-220 K, requires the use of best management practices (BMPs) where applicable to control or abate the discharge of pollutants where numeric limitations are infeasible, or the practices are necessary to achieve effluent limitations or to carry out the purposes and intent of the State Water Control Law and the Clean Water Act. This special condition requires the development of a Pollutant Minimization Plan to reduce PCBs in the discharge to come into compliance with the Water Quality Standards or an approved TMDL. A total PCB value of 1495.53 pg/l was reported during the past permit term, exceeding the human health water quality criterion of 640 pg/l.

k. **Section 303(d) List (TMDL) Reopener**
Rationale: Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed it they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act.

l. **Pretreatment**
Rationale: VPDES Permit Regulation, 9 VAC 25-31-730 through 900, and 40 CFR Part 403 require certain existing and new sources of pollution to meet specified regulations.

An Industrial User Survey is required for POTW's that do not have an approved Pretreatment Program but have design flow greater then 0.04 MGD. This survey will be required to be submitted within 180 days of the effective date of the permit.

m. **Part II, Conditions Applicable to All Permits**
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21. Changes to Permit:

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
		From	To	From	To		
001	ammonia			1.1 mg/l (Jan-May)	0.7 mg/l (Jan-May)	Decreased criterion based on new effluent pH and temperature data	4/28/15
001	ammonia			0.6 mg/l (Jun-Dec)	0.4 mg/l Jun - Dec)	Decreased criterion based on new effluent pH and temperature data	4/28/15
001	Total Recoverable Zinc	None	1/M	34 µg/l	42 µg/l	Evaluation of new effluent and stream data and incorporation of metals translator	4/28/15
001	Total Recoverable Copper	None	1/M	None	18 µg/l	Evaluation of new effluent data and implementation of WER	4/28/15
001	Total Recoverable Nickel	None	1.M	None	10 µg/l	Evaluation of new effluent data	4/28/15
001	Total Recoverable Antimony	None	1/M	None	0.72 µg/l	Evaluation of new effluent data	4/28/15

Special Condition Changes:

Added Schedule of Compliance for Total Recoverable Copper, Nickel, and Antimony (removed zinc from schedule).

Added PCB Pollutant Minimization Plan requirement. (Replaced PCB monitoring requirement)

Removed WQS monitoring condition/Attachment A special condition.

Revised special condition language where necessary to reflect current language per the VPDES Permit Manual.

22. Variances/Alternate Limits or Conditions:

A Testing waiver was granted for TRC since an alternative to chlorination (UV disinfection) is used. The permit application instructions allow for the submittal of *E. coli* data in the place of fecal coliform data; therefore the *E. coli* data was accepted.

Reducing monitoring frequencies were not considered since the facility has received warning letters and/or NOVs during the past three years.

23. Regulation of Users:

Not applicable. This facility is being permitted as a publicly-owned treatment works and is subject to the pretreatment requirements by 9 VAC 25-31-730 et seq.

24. Public Notice Information required by 9 VAC 25-31-280 B:

All pertinent information is on file and may be inspected, and copied by contacting Lynn V. Wise at:

Virginia DEQ Blue Ridge Regional Office, 3019 Peters Creek Road, Roanoke, VA 24019
Telephone No. (540) 562-6787, lynn.wise@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may review the draft permit and application at the DEQ Blue Ridge Regional Office (Roanoke) by appointment.

25. Additional Comments:
Previous Board Action: None.

Staff Comments:

Public Comment:

Other Agency Comments:
The US Fish & Wildlife Service (USF&WS) requested that DEQ coordinate screening for Threatened and Endangered Species. USF&WS indicated that the federally listed endangered Roanoke logperch and bigeye jumprock, a federal species of concern, are known to occur in Goose Creek downstream of this facility's discharge. Based on a review of the application and current permit and Fact Sheet, it was requested that the need for a copper limitation be investigated. The USF&WS also noted support for continued ammonia limitations and the continued use of UV disinfection. All of these concerns are addressed in the draft permit action.

26. 303(d) Listed Segments (TMDL):

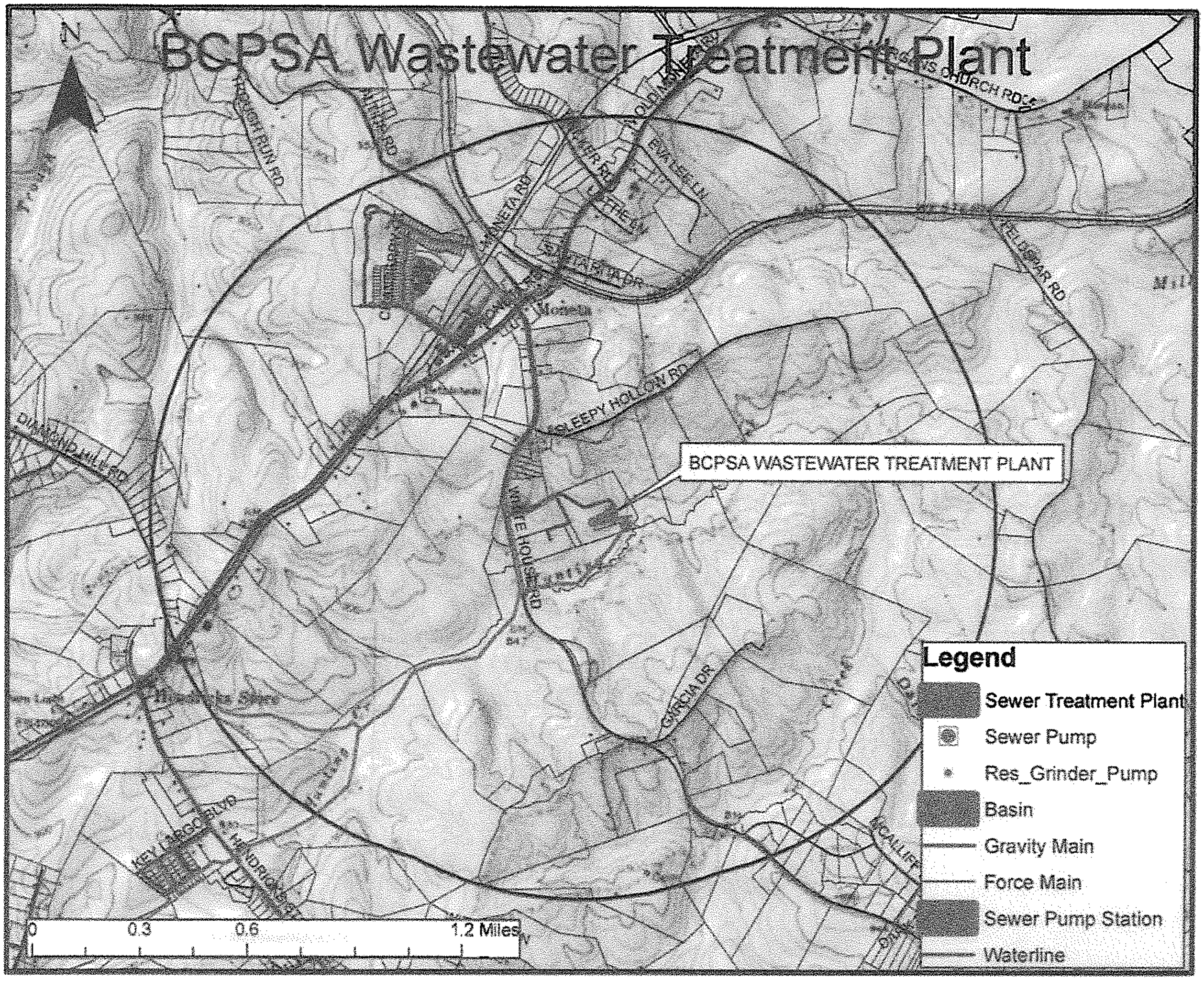
Bacteria – The stream to which this facility discharges is listed on the 303(d) list due the bacteria impairment. Originally, the approved TMDL for the Cub Creek, Turnip Creek, Buffalo Creek, Buffalo Creek (UT), and Staunton River Watersheds did not include an allocation for this facility because it was not on-line when the TMDL was developed. A modification of the TMDL was approved on December 1, 2010, which gave the discharge an allocation/loading based on the design flow of the facility equivalent to the water quality standard (126 n/100ml). The permit includes an effluent limitation of 126 n/100ml geometric mean.

PCBs – The approved PCB TMDL for the Roanoke (Staunton) River watershed does not assign an allocation to the Moneta Regional WWTP. However, monitoring performed during the last permit cycle indicated the potential to exceed the human health water quality criterion. In response, the permit includes a condition to develop a PCB Pollutant Minimization Plan in an effort to reduce the total PCB concentration. It is anticipated that the TMDL will be modified to include an allocation for this facility. The permit contains a re-opener condition that may allow these limits to be modified, in compliance with section 303(d)(4) of the Act, if required by an approved TMDL.

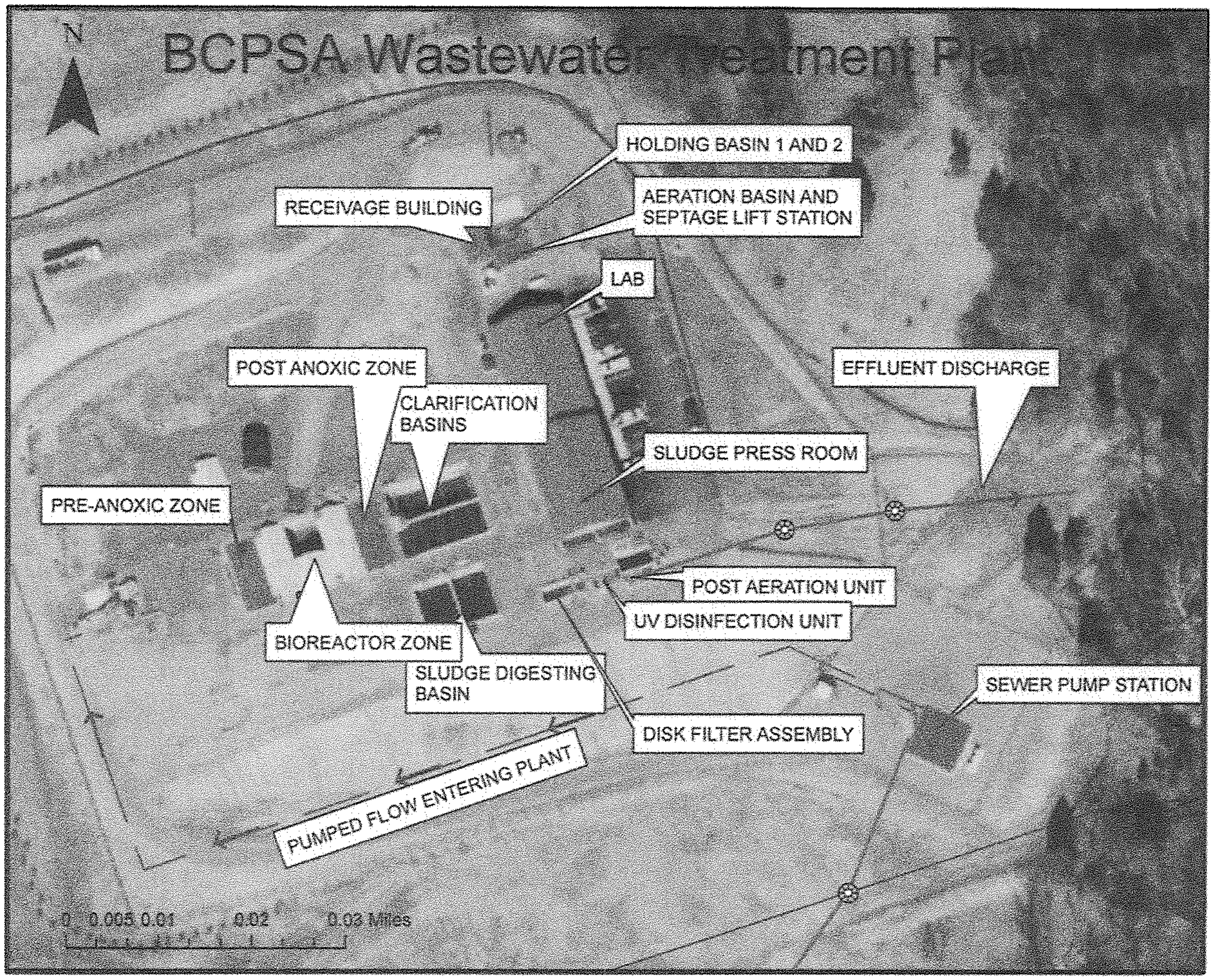
ATTACHMENT A

GENERAL FACILITY INFORMATION

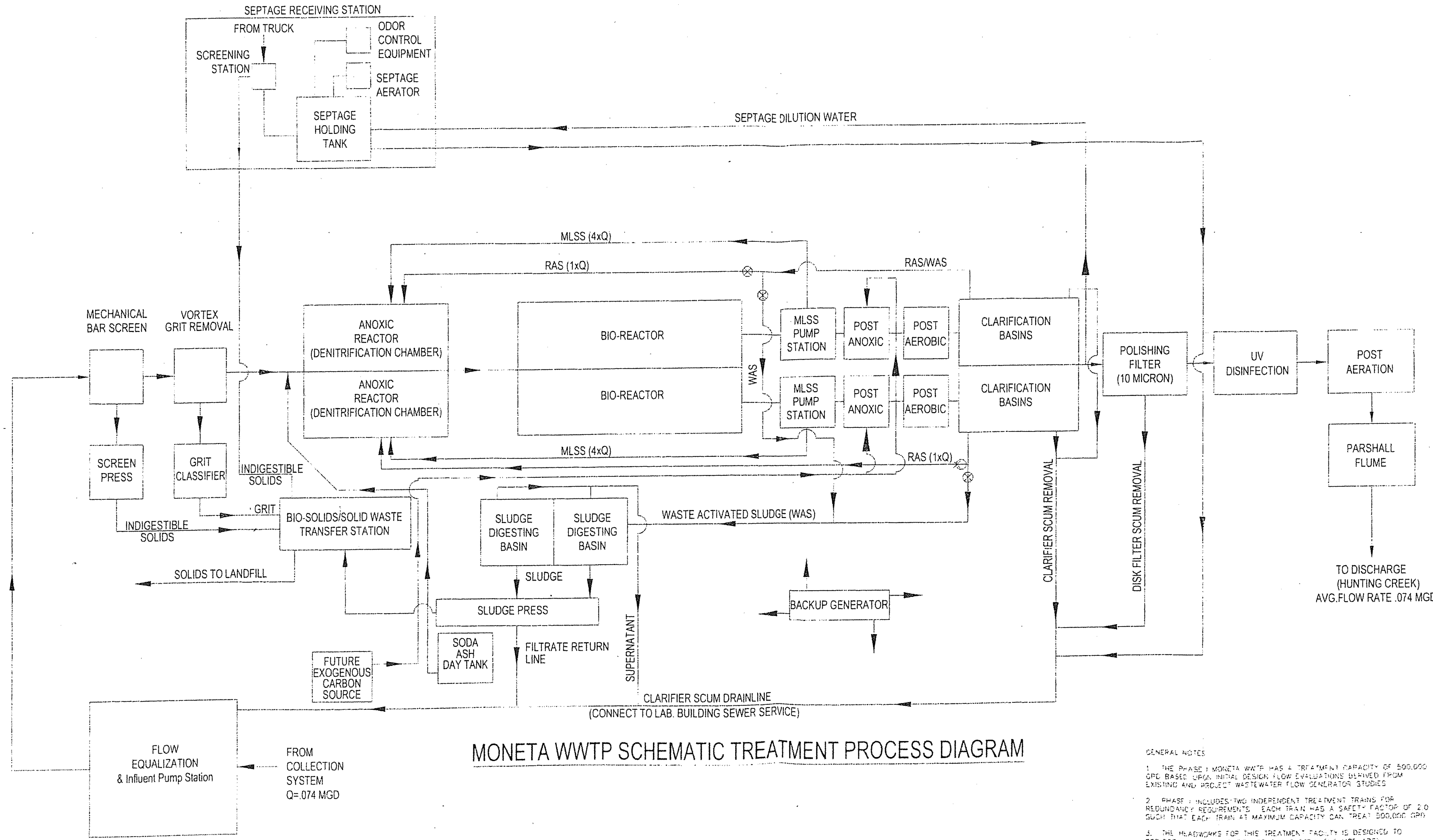
1. Location Map
2. Schematic of Wastewater Facility
3. Site Visit Memo



no wells within 1/4 mile
of facility



N
BCPSA Wastewater Treatment Plant
HOLDING BASIN 1 AND 2
RECEIVAGE BUILDING
AERATION BASIN AND
SEPTAGE LIFT STATION
LAB
POST ANOXIC ZONE
CLARIFICATION
BASINS
EFFLUENT DISCHARGE
SLUDGE PRESS ROOM
PRE-ANOXIC ZONE
POST AERATION UNIT
UV DISINFECTION UNIT
BIOREACTOR ZONE
SLUDGE DIGESTING
BASIN
SEWER PUMP STATION
DISK FILTER ASSEMBLY
PUMPED FLOW ENTERING PLANT
0 0.005 0.01 0.02 0.03 Miles



MONETA WWTP SCHEMATIC TREATMENT PROCESS DIAGRAM

GENERAL NOTES

1. THE PHASE I MONETA WWTP HAS A TREATMENT CAPACITY OF 500,000 GPD BASED UPON INITIAL DESIGN FLOW EVALUATIONS DERIVED FROM EXISTING AND PROJECT WASTEWATER FLOW GENERATOR STUDIES

2. PHASE I INCLUDES TWO INDEPENDENT TREATMENT TRAINS FOR REDUNDANCY REQUIREMENTS. EACH TRAIN HAS A SAFETY FACTOR OF 2.0 SUCH THAT EACH TRAIN AT MAXIMUM CAPACITY CAN TREAT 500,000 GPD

3. THE HEADWORKS FOR THIS TREATMENT FACILITY IS DESIGNED TO REFLECT ULTIMATE CAPACITY OF THIS SYSTEM. (1.5 MGD ADF)

4. THE TERTIARY TREATMENT EQUIPMENT FOR THIS TREATMENT FACILITY REFLECTS SUFFICIENT CAPACITY FOR THE ULTIMATE DESIGN (1.5 MGD ADF)

5. THE WWTP FACILITY WILL HAVE A CLASS I RELIABILITY RATING AS DEFINED BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

6. ALL SCHEMATIC DESIGN AND FINAL DESIGN ADHERE TO THE MINIMUM REQUIREMENTS SPECIFIED IN THE SEWAGE COLLECTION AND TREATMENT (SCAT) REGULATIONS

7. GENERATOR IS AT WWTP FACILITY TO PROVIDE BACKUP ELECTRICITY FOR ALL PLANT PROCESSES

Moneta Regional Sewer System
Bedford County Public Service Authority
Bedford County, Virginia
Record Drawings

PROJECT NO.
DATE. JAN. 28, 2010
DRAWN BY: D.W.H.
CHECKED BY. R.B.C.

WWTP SCHEMATIC FLOW PROCESS DIAGRAM

C 4.0

wastewater to the WWTP. Total dynamic head (TDH) is small as the station is located in a corner of the WWTP. The Influent Pump Station has an alternating duplex pumping arrangement, a combined wetwell/pump house installation with emergency power provided by a back-up generator, and a Class I Reliability Rating.

Overview of WWTP

Wastewater is lifted from the Influent Pump Station to the WWTP via pumps. Influent wastewater is delivered to a bar screen and grit removal system. This equipment removes unsoluble and undigestable solids commonly found in wastewater streams. The solids will be lifted by mechanical actuation to a solids receiving bin such as a portable metal dumpster or on-site dump truck. The grit removal system consists of a vortex grit separator and grit classifier unit. The bar screen/grit removal equipment is sized for the ultimate WWTP installation.

Wastewater flow from the bar screen equipment enters a flow diverter assembly. This assembly provides the ability to alternate and/or balance wastewater flows to different treatment trains proposed in the WWTP.

Wastewater from the Headworks/Grit Removal unit then flows into a Pre Anoxic mixing basin where the nitrification process begins. Mixed liquor suspended solids (MLSS) are returned back to this anoxic zone also. This system consists of a hybrid process that combines the benefits of both the activated sludge and fixed film treatment. This system provides a robust treatment process which consumes about one-third of the power of conventional treatment processes. The Bio-Wheel™ system is simple to operate, as it does not require complex programmable logic controllers (PLCs). The system provides the ability to treat a wide range of flows and is designed to accommodate heavy loading situations. Phase I of this project (the current design) provides two separate treatment trains, with each having a treatment capacity of 0.25 MGD or 0.5 MGD combined. The design of the system includes a peak design factor of 2.0. The peak combined design value is 1.0 MGD.

After treatment in the bio-reactor, wastewater flows to a Post Aerobic zone bin and then into the clarifier, where the wastewater is provided with the quiescence required for the solids to settle out. The clarifier system consists of twin concrete tanks. The system includes a belt and paddle assembly which slowly scrapes the bottom of the clarifier tanks and empties sludge into a sludge return well located on one end of the clarifier assembly.

After clarification, wastewater flows to a polishing filter assembly which consists of a disk filter equipped with a manmade cloth filter system. Fine particles still in suspension are trapped in the cloth filter and then removed through the use of a unique suction removal system. Particles removed from this filter are returned to the front of the treatment process. The disk filter assembly has a 10 micron filtering rating and provides for an extremely clean and clear effluent from the wastewater treatment plant.

After flowing through the disk filter, wastewater is disinfected using ultraviolet (UV) light processes. This system consists of redundant UV equipment and achieves a 99.99 percent pathogen kill rate, rendering the wastewater virtually free of bacterial and viral organisms.

After UV disinfection, the wastewater is aerated using a mechanical post-aeration unit. The unit consists of a blower assembly that provides fine air diffusion of the high quality effluent. The post aeration assembly provides the ability to elevate dissolved oxygen concentrations to approximately 9 mg/L.

After post-aeration, the high quality effluent is discharged through a piping network to the adjoining Hunting Creek. This stream is located approximately 500 feet from the WWTP.

Another component of the WWTP is the sludge holding and digestion tank system. These tanks are sized for the ultimate size of the treatment plant and provide the ability to dewater and digest the activated sludge discharged from the bio-reactor assemblies. The system has dual redundant tank capabilities, and provides decant pump systems that employ air assisted digestion through the use of diffusers located in the bottom of the holding tanks.

After decanting, sludge is lifted through the use of sludge pumps to the sludge press assembly. The sludge press assembly has the capability of dewatering and pressing sludge for the ultimate treatment plant size (1.0 MGD). A polymer feed system provides assistance with dewatering during sludge press operation. Dewatered sludge is conveyed to a dump truck and disposed to a local sanitary landfill as approved by the DEQ.

The WWTP includes a laboratory building that provides floor space for WWTP operations, treatment plant instrumentation, sludge press operation, chemical storage and feed systems, and general office space. The laboratory building has telemetry equipment necessary to provide remote monitoring and operations of the system from the BCPSA office.

The WWTP is designed and constructed with the ability to receive and treat septage from the local community. The septage receiving station has redundant concrete holding tanks necessary to store and meter the septage to the WWTP so that the process can be sustained. The septage holding tanks have a mixing capability providing thorough mixing of the septage and providing some aeration capability. The septage station has odor mitigation equipment installed, consisting of scrubbers and charcoal filters installed in conjunction with sealed covers located on the concrete septage holding tanks. The septage receiving station is sized at approximately 20,000 GPD ultimate capacity. Please see the section titled "Septage Receiving Station."

The entire WWTP facility has a Class I Reliability Rating. Emergency power is provided in the form of emergency electrical generators located within the WWTP compound which are described in Appendix IV. The power requirement for the ultimate WWTP will be approximately 6000 kW/hr at 460 volts, three phase.

The WWTP is accessed by a dedicated access road provided as part of the WWTP site development program. The WWTP is enclosed in a chain-link fenced compound and has lockable gates.

The facility operates under Virginia Pollution Discharge Elimination System (VPDES) Permit # VA0091669. The Discharge Permit limits are as follows:

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office, Water Division

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit, Moneta Regional Wastewater Treatment Plant
VPDES Permit No. VA0091669

TO: File

LVW

FROM: Lynn V. Wise, Environmental Engineer, Sr.

DATE: May 5, 2015

COPIES:

A visit was made to the referenced facility on May 5, 2015, for the purposes of reissuing the VPDES permit. Mr. Michael Ramsey, Operations Manager for the Bedford Regional Water Authority, provided a tour of the facility. The treatment plant is designed to treat 0.5 MGD and begins with flow equalization at the head pump station (#3). Wastewater is pumped up to the plant, through screening (solids auger and bar screen when flow is high) and a grit vortex. Solids are collected and hauled to the landfill. Next, the wastewater is directed to a splitter box and into the three-stage fixed film biological process. Two treatment trains are available but only one is used at any time. The wastewater first enters the pre-anoxic chamber (where mixing is provided) followed by the biowheel tank where there are three biowheels in series. Finally, the wastewater enters the post-anoxic chamber. Some mixed liquor is returned to the pre-anoxic chamber. The plant is equipped to provide post aeration after the post-anoxic chamber; however, due to excessive growth of filamentous organisms, it is not currently being used. Wastewater flows from the post-anoxic chamber to the clarifier to allow solids to settle. Skimmed solids are returned to the head of the plant. Settled solids are routed to the digester; sludge can also be returned to the pre-anoxic chamber if needed. Wastewater leaving the clarifier passes through a 10-um disc filter, then through one of two UV disinfection channels. A third channel is available, but not currently being used. Each channel contains one bank of 28 UV lamps. After disinfection, the wastewater flows into the post aeration chamber. The effluent is discharged to Hunting Creek through an outfall pipe fitted with a flapper valve.

Sludge is wasted to one of two aerobic digesters every other day. It was noted that septage, at a rate of no more than 25, 000 gallons per week, is currently being pumped directly to the digesters from the septage receiving station. The blowers are periodically stopped to allow the sludge to settle. Digested sludge is conditioned with polymer and dewatered using a belt filter press. Sludge is pressed about two times per week resulting in one dumpster load being hauled to the Bedford County landfill per week.

In the vicinity of the discharge point, the stream is severely meandering with some short straight stretches. The stream consists of pools and riffles with an average width of about six feet and an average depth of about four to five inches. The bottom consisted of mainly small rock with no evidence of sludge deposits or aquatic plants/algae.

The facility is equipped with a laboratory. Technicians routinely perform process control tests. Tests conducted for permit compliance include pH, DO, BOD_5 and TSS. Samples for *E coli*, TKN, and ammonia are sent to REIC Laboratories for analysis.

ATTACHMENT B

RECEIVING STREAM INFORMATION

1. Flow Frequency Memo
2. Ambient Water Quality Data (4ABDA003.63 and 4AHNT001.29)
3. 2012 Impaired Waters Fact Sheets
4. TMDL Excerpts/Documentation

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office, Water Division

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Flow Frequency Determination

TO: File

FROM: Lynn V. Wise, Environmental Engineer, Sr.

DATE: March 25, 2015

COPIES:

The Moneta Regional Wastewater Treatment Plantdischarges to Hunting Creek near Moneta, VA. Stream flow frequencies are requiredat this site for the purpose of calculating effluent limitations for the VPDES permit.

The USGS has operated a continuous record gage onTinker Creek near Daleville, VA (#02055100) since 1956. This gage was selected for determining critical stream flowsin Hunting Creek due to the relative similarity in drainage area and proximity to the discharge site. The flow frequencies for the gage and the discharge point are presented below. The values at the discharge point were determined by drainage area proportions and do not address any withdrawals, discharges, or springs lying upstream.

Tinker Creek near Daleville, VA (#02055100):

Drainage Area = 11.7 mi^2

1Q10 = 0.97 cfs	High Flow 1Q10 = 2.3 cfs
7Q10 = 1.04 cfs	High Flow 7Q10 = 2.6 cfs
30Q5 = 1.68 cfs	HM = 5.0 cfs
30Q10 = 1.26 cfs	High Flow 30Q10 = 3.2 cfs
1Q30 = 0.65 cfs	

Hunting Creek at discharge point:

Drainage Area = 1.54 mi^2

1Q10 = 0.128 cfs (0.083 MGD)	High Flow 1Q10 = 0.303 cfs (0.196 MGD)
7Q10 = 0.137 cfs (0.088 MGD)	High Flow 7Q10 = 0.342 cfs (0.221 MGD)
30Q5 = 0.221 cfs (0.143 MGD)	HM = 0.658 cfs (0.425 MGD)
30Q10 = 0.166 cfs (0.107 MGD)	High Flow 30Q10 = 0.421 cfs (0.272 MGD)
1Q30 = 0.086 cfs (0.055 MGD)	

The high flow months are January through May.

					00530 RESIDUE, TOTAL NONFILTRABLE (MG/L)		00600 NITROGEN, TOTAL (MG/L AS N)		00610 NITROGEN, AMMONIA, TOTAL (MG/L AS N)		00630 NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)		00665 PHOSPHORUS, TOTAL (MG/L AS P)		31648 E. COLI - MTEC-MF N0/100ML		82079 TURBIDITY,LAB NEPHELOMETRIC TURBIDITY UNITS, NTU	
					Value	Com C	Value	Com C	Value	Com C	Value	Com C	Value	Com C	Value	Com C	Value	Com Code
Station ID	Collection Date Time	Temp Celcius	Do Probe	Field Ph														
4AHNT001.29	01/30/2007 12:00	NULL	NULL	NULL	14.000	U	1.180	U	.120	U	.880	U	.050	U	225.000	NULL	11.660	U
	03/27/2007 11:30	16.1	10.3	7.4	5.000	NULL	.370	NULL	.040	U	.230	NULL	.010	NULL	**750.000**	NULL	8.100	NULL
	05/07/2007 11:30	14	11.4	7.3	8.000	NULL	.600	NULL	.040	U	.300	NULL	.040	NULL	**2000.000**	L	10.400	NULL
	07/17/2007 11:00	21.9	7.8	7.1	29.000	NULL	1.070	NULL	.080	NULL	.280	NULL	.090	NULL	**2000.000**	L	32.700	NULL
	09/19/2007 12:00	17.2	8.4	7.2	9.000	NULL	.610	NULL	.040	NULL	.230	NULL	.040	NULL	**1400.000**	NULL	13.100	NULL
	11/13/2007 11:30	11.6	9.4	7.1	5.000	NULL	.360	NULL	.040	U	.140	NULL	.030	NULL	**2000.000**	L	7.900	NULL
	01/29/2008 11:00	4.8	12	7	NULL	NULL	.470	NULL	NULL	NULL	NULL	NULL	.020	NULL	300.000	NULL	NULL	NULL
	03/27/2008 11:30	13.4	10.7	7.1	NULL	NULL	.340	NULL	NULL	NULL	NULL	NULL	.030	NULL	**520.000**	NULL	NULL	NULL
	05/05/2008 12:30	21.1	8.9	7.1	NULL	NULL	1.700	NULL	NULL	NULL	NULL	NULL	.130	NULL	**2000.000**	L	NULL	NULL
	07/08/2008 12:30	21.6	7	6.9	NULL	NULL	2.580	NULL	NULL	NULL	NULL	NULL	.100	NULL	**2000.000**	L	NULL	NULL
	09/15/2008 13:00	22.7	6.1	7.3	NULL	NULL	5.880	NULL	NULL	NULL	NULL	NULL	.270	NULL	**2000.000**	L	NULL	NULL
	11/18/2008 11:30	6.5	13	7.3	NULL	NULL	.390	NULL	NULL	NULL	NULL	NULL	.020	NULL	300.000	NULL	NULL	NULL

	Temp Celcius	Do Probe	Field Ph				
March	16.1	10.3	7.4	16.1	4.8		
May	14	11.4	7.3	14	6.5		
July	21.9	7.8	7.1		11.6	21.9	
Sept	17.2	8.4	7.2		13.4	17.2	
Nov	11.6	9.4	7.1		14	11.6	
Jan	4.8	12	7	4.8	16.1		
March	13.4	10.7	7.1	13.4	17.2		
May	21.1	8.9	7.1	21.1	21.1		
July	21.6	7	6.9		21.6	21.6	
Sept	22.7	6.1	7.3		21.9	22.7	
Nov	6.5	13	7.3		22.7	6.5	
annual 90%tile	21.9	12	7.3	19.1	HighFlow 90%tile Temp	22.3	Low Flow 90%tile T
annual 10%tile			7				

					Parm. Code	00076		00095		00310		00403		00410		00500		00505		00510	
					Name	TURBIDITY,HACH TURBIDIMETER (FORMAZIN TURB UNIT)		SPECIFIC CONDUCTANCE (UMHOS/CM @ 25C)		BOD, 5 DAY, 20 DEG C MG/L		PH, LAB, STANDARD UNITS		ALKALINITY, TOTAL (MG/L AS CACO3)		RESIDUE, TOTAL (MG/L)		RESIDUE, TOTAL VOLATILE (MG/L)		RESIDUE, TOTAL FIXED (MG/L)	
Station ID	Collection Date Time	Temp Celcius	Do Probe	Field Ph		Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Cod
4ABDA003.63	04/05/2000 10:00	NULL	NULL	NULL		12.200	NULL	84.700	NULL	2.000	NULL	5.930	NULL	30.200	NULL	77.000	NULL	16.000	NULL	61.000	NULL
	06/13/2000 10:00	24.2	7.1	7.5		16.700	NULL	105.000	NULL	2.000	U	5.960	NULL	38.100	NULL	105.000	NULL	19.000	NULL	86.000	NULL
	07/18/2000 15:00	24.6	7.5	8		12.800	NULL	106.000	NULL	3.000	NULL	5.950	NULL	38.700	NULL	84.000	NULL	18.000	NULL	66.000	NULL
	09/19/2000 13:30	18.4	8.7	8.6		182.000	NULL	77.600	NULL	3.000	NULL	5.780	NULL	22.500	NULL	277.000	NULL	49.000	NULL	228.000	NULL
	11/09/2000 10:00	10.6	10.2	9		6.100	NULL	92.800	NULL	4.000	NULL	5.740	NULL	35.000	NULL	78.000	NULL	12.000	NULL	66.000	NULL
	01/18/2001 12:00	3	12.4	8.2		6.100	NULL	80.500	NULL	2.000	U	5.760	NULL	30.400	NULL	67.000	NULL	6.000	NULL	61.000	NULL
	03/19/2001 13:30	8.5	11.9	8.8		5.610	NULL	87.800	NULL	2.000	U	5.660	NULL	30.800	NULL	73.000	NULL	33.000	NULL	40.000	NULL
	05/01/2001 13:00	18.2	8.3	8.7		13.800	NULL	89.600	NULL	2.000	NULL	5.680	NULL	33.600	NULL	68.000	NULL	15.000	NULL	53.000	NULL
	07/10/2003 13:00	22.64	8.88	7.29		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	93.000	NULL	NULL	NULL	NULL	NULL
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	12/22/2003 11:50	NULL	NULL	NULL		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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	07/19/2004 12:40	21.5	8.29	7.09		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	99.000	NULL	NULL	NULL	NULL	NULL
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	01/11/2005 10:40	6.76	11.34	7.1		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	66.000	NULL	NULL	NULL	NULL	NULL
	03/14/2005 14:05	8.27	11.18	7.22		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	65.000	NULL	NULL	NULL	NULL	NULL
	05/24/2005 15:15	15.6	8.6	7.5		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	83.000	NULL	NULL	NULL	NULL	NULL
	07/11/2005 10:00	23.3	8.4	7.9		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	99.000	NULL	NULL	NULL	NULL	NULL
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	07/13/2006 10:00	23.5	7.8	7.8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	139.000	NULL	NULL	NULL	NULL	NULL
	09/06/2006 10:00	19.8	8.4	7.9		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	119.000	NULL	NULL	NULL	NULL	NULL
	11/28/2006 10:00	6.8	13	7.7		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	78.000	NULL	NULL	NULL	NULL	NULL
	01/30/2007 11:00	1	12.5	8.6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	67.000	NULL	NULL	NULL	NULL	NULL
	03/27/2007 10:30	14.8	9.9	7.6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	68.000	NULL	NULL	NULL	NULL	NULL
	05/07/2007 10:30	12.3	11.2	7.5		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	69.000	NULL	NULL	NULL	NULL	NULL
	07/17/2007 10:30	22.7	8	7		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	92.000	NULL	NULL	NULL	NULL	NULL
	09/19/2007 11:30	17.5	8.9	7.2		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	87.000	NULL	NULL	NULL	NULL	NULL
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	03/27/2008 11:00	12.1	10.9	7.1		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	68.000	NULL	NULL	NULL	NULL	NULL
	05/05/2008 11:30	16.3	9.3	7		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	93.000	NULL	NULL	NULL	NULL	NULL
	07/08/2008 12:00	25	6.9	6.4		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	91.000	NULL	NULL	NULL	NULL	NULL
	09/15/2008 12:30	23.3	8	7.6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	110.000	NULL	NULL	NULL	NULL	NULL
	11/18/2008 11:00	5.3	12.8	7.6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	94.000	NULL	NULL	NULL	NULL	NULL
	02/10/2009 11:30	6.2	13	8.5		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	78.000	NULL	NULL	NULL	NULL	NULL
	04/06/2009 11:30	13	9.3	7.5		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	76.000	NULL	NULL	NULL	NULL	NULL
	06/16/2009 15:30	19.6	8.4	7.9		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	102.000	NULL	NULL	NULL	NULL	NULL
	08/13/2009 12:00	23.1	8	8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	114.000	NULL	NULL	NULL	NULL	NULL
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	04/15/2010 13:00	12.7	NULL	8.3		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	63.000	NULL	NULL	NULL	NULL	NULL
	06/10/2010 12:00	22	NULL	8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	102.000	NULL	NULL	NULL	NULL	NULL
	08/31/2010 12:00	23	NULL	8.2		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	94.000	NULL	NULL	NULL	NULL	NULL
	10/13/2010 11:30	17.5	NULL	8.2		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	81.000	NULL	NULL	NULL	NULL	NULL
	12/21/2010 12:30	0.5	13.3	8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	79.000	NULL	NULL	NULL	NULL	NULL
	01/25/2011 10:00	2.3	NULL	7.9		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	69.000	NULL	NULL	NULL	NULL	NULL
	03/29/2011 11:30	7.1	NULL	7		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	74.000	NULL	NULL	NULL	NULL	NULL
	05/11/2011 10:30	17.8	8.7	6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	82.000	NULL	NULL	NULL	NULL	NULL
	07/28/2011 10:00	24.9	NULL	7.6		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	96.000	NULL	NULL	NULL	NULL	NULL
	09/15/2011 10:30	20.8	NULL	8.4		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	88.000	NULL	NULL	NULL	NULL	NULL
	11/15/2011 10:30	12	NULL	8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	77.000	NULL	NULL	NULL	NULL	NULL
	01/31/2012 10:30	4	NULL	7.4		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	65.000	NULL	NULL	NULL	NULL	NULL
	04/03/2012 10:30	12.3	NULL	7.3		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
	06/28/2012 11:30	21	NULL	7.3		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	90.000	NULL	NULL	NULL	NULL	NULL
	10/31/2012 10:30	9	NULL	8		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	82.000	NULL	NULL	NULL	NULL	NULL
	12/04/2012 10:30	8.3	NULL	7.9		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	66.000	NULL	NULL	NULL	NULL	NULL

00515 RESIDUE, TOTAL FILTRABLE (DRIED AT 105C),MG/L		00530 RESIDUE, TOTAL NONFILTRABLE (MG/L)		00535 RESIDUE, VOLATILE NONFILTRABLE (MG/L)		00540 RESIDUE, FIXED NONFILTRABLE (MG/L)		00600 NITROGEN, TOTAL (MG/L AS N)		00610 NITROGEN, AMMONIA, TOTAL (MG/L AS N)		00615 NITRITE NITROGEN, TOTAL (MG/L AS N)		00620 NITRATE NITROGEN, TOTAL (MG/L AS N)		00625 NITROGEN, KJELDAHL, TOTAL, (MG/L AS N)		00665 PHOSPHORUS, TOTAL (MG/L AS P)		00900 HARDNESS, TOTAL (MG/L AS CACO3)	
Value	Com Cod	Value	Com Co	Value	Com Cod	Value	Com Cod	Value	Com Cod	Value	Com Co	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code
52.000	NULL	10.000	NULL	3.000	NULL	7.000	NULL	NULL	NULL	.050	NULL	.010	U	.100	NULL	.400	NULL	.050	NULL	29.000	NULL
79.000	NULL	11.000	NULL	3.000	NULL	3.000	NULL	NULL	NULL	.100	NULL	.020	NULL	.420	NULL	.500	NULL	.080	NULL	32.300	NULL
56.000	NULL	9.000	NULL	4.000	NULL	5.000	NULL	NULL	NULL	.110	NULL	.010	NULL	.340	NULL	.400	NULL	.060	NULL	36.000	NULL
72.000	NULL	204.000	NULL	29.000	NULL	175.000	NULL	NULL	NULL	.090	NULL	.040	NULL	.530	NULL	1.000	NULL	.370	NULL	26.100	NULL
58.000	NULL	3.000	U	3.000	U	3.000	U	NULL	NULL	.040	U	.010	U	.040	U	.300	NULL	.030	NULL	27.000	NULL
67.000	NULL	3.000	NULL	3.000	U	3.000	U	NULL	NULL	.040	U	.010	NULL	.300	NULL	.200	NULL	.040	NULL	27.100	NULL
67.000	NULL	3.000	NULL	3.000	U	3.000	U	NULL	NULL	.040	U	.010	NULL	.110	NULL	.400	NULL	.030	NULL	20.000	NULL
53.000	NULL	15.000	NULL	3.000	NULL	12.000	NULL	NULL	NULL	.040	U	.010	NULL	.040	NULL	.300	NULL	.050	NULL	30.800	NULL
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NULL	NULL	4.000	NULL	NULL	NULL	NULL	NULL	.510	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.030	NULL	NULL	NULL
NULL	NULL	6.000	NULL	NULL	NULL	NULL	NULL	.460	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.030	NULL	NULL	NULL
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NULL	NULL	14.000	NULL	NULL	NULL	NULL	NULL	.530	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.050	NULL	NULL	NULL
NULL	NULL	3.000	U	NULL	NULL	NULL	NULL	.530	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.030	NULL	NULL	NULL
NULL	NULL	7.000	NULL	NULL	NULL	NULL	NULL	.450	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.040	NULL	NULL	NULL
NULL	NULL	20.000	NULL	NULL	NULL	NULL	NULL	.600	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.060	NULL	NULL	NULL
NULL	NULL	79.000	NULL	NULL	NULL	NULL	NULL	1.030	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.250	NULL	NULL	NULL
NULL	NULL	33.000	NULL	NULL	NULL	NULL	NULL	.830	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.140	NULL	NULL	NULL
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NULL	NULL	6.000	NULL	NULL	NULL	NULL	NULL	.580	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.020	NULL	NULL	NULL
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NULL	NULL	13.000	NULL	NULL	NULL	NULL	NULL	.890	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.080	NULL	NULL	NULL
NULL	NULL	12.000	NULL	NULL	NULL	NULL	NULL	.490	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.080	NULL	NULL	NULL
NULL	NULL	11.000	NULL	NULL	NULL	NULL	NULL	.340	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.060	NULL	NULL	NULL
NULL	NULL	3.000	NULL	NULL	NULL	NULL	NULL	.240	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.200	NULL	.030	NULL	NULL	NULL
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NULL	NULL	22.000	NULL	NULL	NULL	NULL	NULL	.560	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.600	NULL	.070	NULL	NULL	NULL
NULL	NULL	10.000	NULL	NULL	NULL	NULL	NULL	.740	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.500	NULL	.070	NULL	NULL	NULL
NULL	NULL	4.000	NULL	NULL	NULL	NULL	NULL	.910	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.500	NULL	.060	NULL	NULL	NULL
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NULL	NULL	6.000	NULL	NULL	NULL	NULL	NULL	.430	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.040	NULL	NULL	NULL
NULL	NULL	11.000	NULL	NULL	NULL	NULL	NULL	.440	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.050	NULL	NULL	NULL
NULL	NULL	23.000	NULL	NULL	NULL	NULL	NULL	.700	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.090	NULL	NULL	NULL
NULL	NULL	27.000	NULL	NULL	NULL	NULL	NULL	.770	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.100	NULL	NULL	NULL
NULL	NULL	11.000	NULL	NULL	NULL	NULL	NULL	.380	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.080	NULL	NULL	NULL
NULL	NULL	19.000	NULL	NULL	NULL	NULL	NULL	.640	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.200	NULL	.070	NULL	NULL	NULL
NULL	NULL	5.000	NULL	NULL	NULL	NULL	NULL	.590	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.100	NULL	.030	NULL	NULL	NULL
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NULL	NULL	20.000	NULL	NULL	NULL	NULL	NULL	.990	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.400	NULL	.090	NULL	NULL	NULL
NULL	NULL	8.000	NULL	NULL	NULL	NULL	NULL	.980	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.060	NULL	NULL	NULL
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NULL	NULL	19.000	NULL	NULL	NULL	NULL	NULL	.820	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.600	NULL	.100	NULL	NULL	NULL
NULL	NULL	9.000	NULL	NULL	NULL	NULL	NULL	.460	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.070	NULL	NULL	NULL
NULL	NULL	4.000	NULL	NULL	NULL	NULL	NULL	.300	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.200	NULL	.030	NULL	NULL	NULL
NULL	NULL	3.000	NULL	NULL	NULL	NULL	NULL	.680	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.500	NULL	.020	NULL	NULL	NULL
NULL	NULL	11.000	NULL	NULL	NULL	NULL	NULL	.620	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.300	NULL	.050	NULL	NULL	NULL
NULL	NULL	17.000	NULL	NULL	NULL	NULL	NULL	1.060	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.400	NULL	.090	NULL	NULL	NULL
NULL	NULL	4.000	NULL	NULL	NULL	NULL	NULL	.400	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.500	NULL	.060	NULL	NULL	NULL
NULL	NULL	3.000	NULL	NULL	NULL	NULL	NULL	.220	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.700	NULL	.030	NULL	NULL	NULL

00940		00945		01003		01013		01028		01029		01043		01052		01053	
CHLORIDE,TOTAL IN WATER MG/L		SULFATE, TOTAL (MG/L AS SO4)		ARSENIC IN BOTTOM DEPOSITS (MG/KG AS AS DRY WGT)		BERYLLIUM IN BOTTOM DEPOSITS(MG/KG AS BE DRY WGT)		CADMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)		CHROMIUM,TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)		COPPER IN BOTTOM DEPOSITS (MG/KG AS CU DRY WGT)		LEAD IN BOTTOM DEPOSITS (MG/KG AS PB DRY WGT)		MANGANESE IN BOTTOM DEPOSITS (MG/KG AS MN DRY WGT)	
Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code
5.000	U	5.000	U	5.000	U	5.000	U	5.000	U	16.900	NULL	5.000	U	15.100	NULL	277.000	NULL
5.000	U	5.000	U	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5.000	U	5.000	U	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5.000	U	7.100	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5.400	NULL	5.000	U	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5.100	NULL	5.000	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5.600	NULL	6.200	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

01068 NICKEL, TOTAL IN BOTTOM DEPOSITS (MG/KG,DRY WGT)		01078 SILVER IN BOTTOM DEPOSITS (MG/KG AS AG DRY WGT)		01093 ZINC IN BOTTOM DEPOSITS (MG/KG AS ZN DRY WGT)		01098 ANTIMONY IN BOTTOM DEPOSITS (MG/KG AS SB DRY WGT)		01108 ALUMINUM IN BOTTOM DEPOSITS (MG/KG AS AL DRY WGT)		01148 SELENIUM IN BOTTOM DEPOSITS (MG/KG AS SE DRY WGT)		01170 IRON IN BOTTOM DEPOSITS (MG/KG AS FE DRY WGT)		31616 FECAL COLIFORM,MEMBR FILTER,M-FC BROTH,44.5 C		31648 E. COLI - MTEC-MF N0/100ML	
Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code
5.000	U	5.000	U	31.800	NULL	5.000	U	8790.000	NULL	1.000	U	12500.000	NULL	300.000	NULL	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	8000.000	>	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	100.000	U	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	2000.000	L	300.000	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	550.000	NULL	600.000	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	250.000	NULL	100.000	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	150.000	NULL	100.000	NULL

31649 ENTEROCOCCI- ME-MF N0/100ML		34480 THALLIUM DRY WGTBOTMG/KG		39061 PCP (PENTACHLOROPHENOL) IN BOT DEPOS DRY SOL UG/KG		39333 ALDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)		39351 CHLORDANE(TECH MIX&METABS),SEDIMENTS,DRY WGT,UG/KG		39363 DDD IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)		39368 DDE IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)		39373 DDT IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)		39383 DIELDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)	
Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code
NULL	NULL	5.000	U	70.000	U	20.000	U	50.000	U	30.000	U	30.000	U	30.000	U	20.000	U
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800.000	L	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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580.000	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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720.000	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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800.000	L	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

39393 ENDRIN IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOLIDS)		39403 TOXAPHENE IN BOTTOM DEPOS. (UG/KILOGRAM DRY SOL.)		39413 HEPTACHLOR IN BOT. DEP. (UG/KILOGRAM DRY SOLIDS)		39526 PCBS TOTAL,IN SEDIMENT,DRY (ISOMER ANALYSES) UG/KG		70300 RESIDUE,TOTAL FILTRABLE (DRIED AT 180C),MG/L		70507 PHOSPHORUS,IN TOTAL ORTHOPHOSPHATE (MG/L AS P)		71921 MERCURY,TOT IN BOT DEPOS (MG/KG AS HG DRY WGT)		75045 HEPTACHLOR EPOXIDE SEDIMENT,DRY,WT,UG/KG		79799 DICOFOL (KELTHANE) SEDIMENT,DRY,WT,UG/KG		82079 TURBIDITY,LAB NEPHELO TURBIDITY UNITS, NTU
Value	Com Code	Value	Com Code	Value	Com Cod	Value	Com Code	Value	Com Cod	Value	Com Code	Value	Com Code	Value	Com Cod	Value	Com Code	Value
40.000	U	100.000	U	20.000	U	20.000	U	NULL	NULL	.030	NULL	.300	U	20.000	U	70.000	U	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	.050	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	11.000
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	15.000
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	8.000
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	7.500
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	8.800
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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	14.300
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	ISLTE		PCLVE		PCMAN		PCPET		PCWLD	
METRIC	NUMBER OF ISOLATES		PROPORTIONAL CONTRIBUTION BY LIVESTOCK (%)		PROPORTIONAL CONTRIBUTION BY HUMAN (%)		PROPORTIONAL CONTRIBUTION BY PET (%)		PROPORTIONAL CONTRIBUTION BY WILDLIFE (%)	
Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code	Value	Com Code
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NULL	24.000	NULL	33.000	NULL	8.000	NULL	26.000	NULL	33.000	NULL
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NULL	24.000	NULL	42.000	NULL	.000	NULL	4.000	NULL	54.000	NULL
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2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L22*

Cause Group Code: **L22R-03-BAC** **Hunting Creek**

Location: Hunting Creek from its confluence with Mill Creek upstream to its headwaters.

City / County: Bedford Co.

Use(s): Recreation

Cause(s) / VA Category: Escherichia coli/ 4A

This initial 2010 303(d) Listing is based on Escherichia coli (E.coli) exceedances of the WQS 235 cfu/100 ml instantaneous criterion. Hunting Creek is tributary to Mill Creek and thence to Goose Creek. The Staunton River Bacteria Total Maximum Daily Load (TMDL) is U.S. EPA approved 6/22/2006 [Fed IDs 24386 / 23315 / 23316 / 24387] and SWCB approved 6/17/2007. Goose Creek [Fed ID 24552] and its tributaries are nested within the Staunton River TMDL Watershed. Therefore Hunting Creek is nested within the Staunton River Bacteria TMDL Watershed. Allocation scenario development is for the entire drainage to provide pollutant reductions for all watersheds contributing to the bacteria impairment. The entirety of the approved TMDL and allocations can be viewed at http://www.deq.virginia.gov.

4AHNT001.29 (Rt.608 Bridge - White House Rd.) - 2012 and 2010 Escherichia coli (E.coli) data exceed the 235 cfu/100 ml instantaneous criterion in eleven of 12 samples. Values in excess of the criterion range from 300 cfu/100 ml to greater than 2000.

Assessment Unit / Water Name / Description	Cause Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L22R_HNT01A10 / Hunting Creek / Hunting Creek from its confluence with Mill Creek upstream to its headwaters.	4A Escherichia coli	Y	2010	6/22/2006	2.55

Hunting Creek

DCR Watershed: L22*

Recreation

	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:			**2.55**

Sources:

- Landfills
- On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
- Unspecified Domestic Waste
- Wet Weather Discharges (Non-Point Source)
- Wildlife Other than Waterfowl

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

2012 Impaired Waters

Category 4 & 5 by 2012 Impaired Area ID*

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Roanoke and Yadkin River Basins

Cause Group Code: **L19R-01-PCB - Roanoke (Staunton) River, Cub Creek**

Location:	Roanoke (Staunton) River from Leesville Dam to the backwaters of Kerr Reservoir, and Cub Creek from its mouth to the crossing of Rough Creek Road near Rough Creek.
City/County	Campbell Co., Charlotte Co., Halifax Co., Pittsylvania Co.
Use(s):	Fish Consumption, Public Water Supply
Cause(s) / VA Category:	PCB in Fish Tissue / 4A

VDH Fish Advisory - PCBs: Issued 7/24/98, revised 8/31/07 & Mercury: Issued 8/31/07
Roanoke (Staunton) River from below Leesville Dam downstream ~ 98 miles to the confluence of Dan River including its tributary Cub Creek up to Rough Creek Road (State Route 695) near Rough Creek.
VDH recommends the following precautions to reduce any potential harmful effects from eating contaminated fish:

Eat smaller, younger fish (within the legal limits). Younger fish are less likely to contain harmful levels of contaminants than larger, older fish.
Eat fewer or smaller servings of fish.
Try to eat different species of fish from various sources (i.e., different creeks, rivers and streams).
Cleaning or cooking contaminated fish does not eliminate or reduce mercury. However, levels of PCBs in fish can be reduced by taking the following precautions:
Remove the skin, the fat from the belly and top and internal organs before cooking the fish.
Bake, broil or grill on an open rack to allow fats to drain away from the meat.
Discard the fats that cook out of the fish.
Avoid or reduce the amount of fish drippings or broth that is used to flavor the meal.
Eat less deep-fried fish, since frying seals contaminants into the fatty tissue.
For more information about fish consumption advisories, including frequently asked questions go to www.vdh.virginia.gov.

PCB Fish Tissue Sampling Results
Near Route 29 - Altavista
4AROA129.55 (2006 FT/Sediment) - 1 species exceeded VDH upper level of concern
Near Long Island
4AROA108.09 (2006 FT/Sediment) - 1 species exceeded VDH upper level of concern
Near Brookneal
4AROA097.07 (2006 FT/Sediment) - 1 species exceeded VDH upper level of concern
Near Route 746 - Randolph
4AROA067.91 (2006 FT/Sediment) - 2 species exceed VDH upper level of concern
Near Route 360 - Clover
4AROA059.12 (2006 FT/Sediment) - 2 species exceed VDH upper level of concern
Near Clarksville
4AROA036.59 (2006 FT/Sediment) - 2 species exceeded VDH lower level of concern
Kerr Reservoir near Ivy Hill
4AROA028.04 (2006 FT/Sediment) - 2 species exceed VDH lower level of concern
Lake Gaston near State Line
4AROA004.54 (2006 FT/Sediment) - 1 species exceeded VDH lower level of concern
Cub Creek near Route 40 Gaging Station
4ACUB010.96 (2006 FT/Sediment) - 1 species exceeded VDH upper level of concern

The Roanoke (Staunton) River is impaired for the Public Water Supply Use due to violations of the tPCB in Water human health criteria. The PWS impairment extends from the confluence of the Big Otter River to the backwaters of Kerr Reservoir. Violation information is provided below.

Station IDs:
2007-2008 PCB TMDL Monitoring
4AROA124.59
tPCB in Water Violations - 2909 pg/L & 4466 pg/L
4AROA097.76
tPCB in Water Violations - 1115 pg/L & 4304 pg/L
4AROA090.50
tPCB in Water Violations - 1192 pg/L & 1625 pg/L
4AROA067.91
tPCB in Water Violations - 1336 pg/L & 1307 pg/L
4AROA059.12

2012 Impaired Waters

Category 4 & 5 by 2012 Impaired Area ID*

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Roanoke and Yadkin River Basins

Cause Group Code: **L19R-01-HG - Roanoke (Staunton) River, Cub Creek, Kerr Reservoir**

Location:	Roanoke (Staunton) River from Leesville Dam to the John H. Kerr Dam including Kerr Reservoir, its tributaries Eastland Creek and Nutbush Creek (within the state of Virginia) and Cub Creek from its mouth to the crossing of Rough Creek Road near Rough Creek.
City/County	Campbell Co., Charlotte Co., Halifax Co., Mecklenburg Co., Pittsylvania Co.
Use(s):	Fish Consumption
Cause(s) / VA Category:	Mercury in Fish Tissue / 5A

VDH Fish Advisory - PCBs: Issued 7/24/98, revised 8/31/07 & Mercury: Issued 8/31/07
Roanoke (Staunton) River from below Leesville Dam downstream ~ 98 miles to the confluence of Dan River including its tributary Cub Creek up to Rough Creek Road (State Route 695) near Rough Creek.
VDH recommends the following precautions to reduce any potential harmful effects from eating contaminated fish:

Eat smaller, younger fish (within the legal limits). Younger fish are less likely to contain harmful levels of contaminants than larger, older fish.
Eat fewer or smaller servings of fish.
Try to eat different species of fish from various sources (i.e., different creeks, rivers and streams).
Cleaning or cooking contaminated fish does not eliminate or reduce mercury. However, levels of PCBs in fish can be reduced by taking the following precautions:
Remove the skin, the fat from the belly and top and internal organs before cooking the fish.
Bake, broil or grill on an open rack to allow fats to drain away from the meat.
Discard the fats that cook out of the fish.
Avoid or reduce the amount of fish drippings or broth that is used to flavor the meal.
Eat less deep-fried fish, since frying seals contaminants into the fatty tissue.
For more information about fish consumption advisories, including frequently asked questions go to www.vdh.virginia.gov.

Mercury Fish Tissue Sampling Results
Near Route 29 - Altavista
4AROA129.55 (2006 FT/Sediment) - 2 species exceed Mercury VDH level of concern
Near Brookneal
4AROA097.07 (2006 FT/Sediment) - 1 species exceeded Mercury VDH level of concern
Near Route 746 - Randolph
4AROA067.91 (2006 FT/Sediment) - 1 species exceeded Mercury VDH level of concern
Near Route 360 - Clover
4AROA059.12 (2006 FT/Sediment) - 4 species exceed Mercury VDH level of concern
Near Clarksville
4AROA036.59 (2006 FT/Sediment) - 1 species exceeded Mercury VDH level of concern
Kerr Reservoir near Ivy Hill
4AROA028.04 (2006 FT/Sediment) - 2 species exceed Mercury VDH level of concern
Lake Gaston near State Line
4AROA004.54 (2006 FT/Sediment) - 1 species exceeded Mercury VDH level of concern

Assessment Unit	Water name	Location Description	Cause Category	Cause Name	Cycle First Listed	TMDL Schedule	Size
VAC-L19R_ROA01A00	Roanoke (Staunton) River	Roanoke (Staunton) River mainstem from the Town of Altavista POTW downstream to the Big Otter River confluence with the Roanoke (Staunton) River.	5A	Mercury in Fish Tissue	2008	2020	3.76
VAC-L19R_ROA03A00	Roanoke (Staunton) River	Roanoke (Staunton) River mainstem from the Goose Creek mouth on downstream to the Town of Altavista POTW.	5A	Mercury in Fish Tissue	2008	2020	6.79
VAC-L19R_ROA04A00	Roanoke (Staunton) River	Roanoke (Staunton) River mainstem from Leesville Dam downstream to the mouth of Goose Creek.	5A	Mercury in Fish Tissue	2008	2020	3.46

Bacteria TMDLs for the Cub Creek, Turnip Creek, Buffalo Creek, Buffalo Creek (UT), and Staunton River Watersheds, Virginia

Submitted by

Virginia Department of Environmental Quality

Prepared by

GEORGE MASON UNIVERSITY

and

THE Louis Berger Group, INC.
2300 N Street, NW
Washington, DC 20037

April 2006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

December 1, 2010

Mr. David S. Lazarus
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Dear Mr. Pollock:

The United States Environmental Protection Agency (EPA) has reviewed the Virginia Department of Environmental Quality's (DEQ's) request to amend the bacteria Total Maximum Daily Load (TMDL) and waste load allocations (WLAs) developed for the Staunton River, located in Campbell, Pittsylvania, Halifax, and Charlotte Counties, Virginia. The original bacteria TMDL for the Staunton River (VAC-L19R-01) was approved by EPA on June 20, 2006 to address recreational use impairments. DEQ has requested the following modifications to the original TMDL:

- The permit for the Dan River Brookneal Facility (VA0001538) has expired and the permittee has requested that the permit be terminated. Therefore, the WLA for VA0001538 (2.31E+12 cfu/year) will be removed and set aside as a future growth WLA.
- The permit for the WestPoint Stevens Facility (VA0050822) has expired and the permittee has requested that the permit be terminated. Therefore, the WLA for VA0050822 (1.41E+11 cfu/year) will be removed and set aside as a future growth WLA.
- The Moneta Adult Detention Facility (VA0023515), which was assigned a wasteload allocation (WLA) of 3.65E+10 cfu/year in the original TMDL, is now discharging to the Moneta Sewage Treatment Plant. Therefore, the WLA for VA0023515 will be removed and set aside as a future growth WLA.
- The Moneta Sewage Treatment Plant (VA0091669) was overlooked during original TMDL development and was not assigned a WLA. To correct this error, the facility will be assigned a WLA 8.69E+11 cfu/year. This WLA will accommodate a design flow of 500,000 gallons/day at a permitted E. coli concentration of 126 cfu/100ml.
- The Drakes Branch Wastewater Treatment Plant (VA0084433) has requested that its design flow be increased from 80,000 gallons/day to 400,000 gallons/day. To accommodate a design flow of 400,000 gallons/day at a permitted E. coli concentration of 126 cfu/100ml the WLA for this facility will be increased from 1.39E+11 cfu/year to 6.9E+11 cfu/year (an increase of 5.51E+11 cfu/year).

The original total WLA for the Staunton River was 2.34E+13 cfu/year. With the modifications identified above, the new total WLA for the Staunton River will be 2.23E+13 cfu/year, a difference of 1.10E+12 cfu/year. However, the original WLA will remain the same, and the difference in the original and revised WLAs (1.10E+12 cfu/year) will be reserved for future growth.

In summary, the modification requested by DEQ will not change the original TMDL, WLA and LA for the Staunton River. Based upon this information, EPA approves the requested modifications to the Staunton River TMDL. If you have any questions or comments concerning this letter, please do not hesitate to call me at (215) 814-5796.

Sincerely,

Helene Drago

Helene Drago, Manager
TMDL Program

FINAL

Roanoke River PCB TMDL Development (Virginia)

December 2009

Prepared for:
United States Environmental Protection Agency, Region 3
Contract EP-C-08-004, Task Order #2008-041

Prepared by:

Tetra Tech, Inc.
10306 Eaton Place, Suite 340
Fairfax, VA 22030

ATTACHMENT C

EFFLUENT SCREENING AND LIMITATIONS

1. DMR Effluent Data
2. Effluent pH, Temperature Data
3. Effluent metals and PCB Data
3. DO Model Input/Output Files
4. MIX.EXE Printout
5. MSTRANTI/WLA Spreadsheet
6. STATS.EXE Printouts
7. Zinc Translator Study
8. Copper WET Study

Moneta Regional Wastewater Treatment Plant - VPDES Permit No. VA0091669

DMR Data

Due Date	BOD mg/l Mo. Avg	BOD mg/l Max Wk Avg	TSS mg/l Mo. Avg	TSS mg/l Max Wk Avg	pH su Min	pH su Max	DO mg/l Min	TKN mg/l Mo. Avg	TKN mg/l Max Wk Avg	E. Coli GM	NH3 mg/l Mo. Avg	NH3 mg/l Mx Wk Avg	Zinc µg/l Avg/Max
10-Aug-2010	<QL	<QL	3.5	5.3	7.6	8.8	7.6	1.9	3.7	17	0.95	0.95	
10-Sep-2010	<QL	<QL	9.8	16.6	7.8	8.8	7.4	1.62	2.26	25	0.6	0.6	
10-Oct-2010	<QL	<QL	8.5	10.3	7.8	8.6	7.7	3.21	7.83	4	0.28	0.28	
10-Nov-2010	<QL	<QL	7.75	10.66	7.8	8.5	8.4	2.166	3.73	2	0.7	0.66	
10-Dec-2010	<QL	<QL	4.9	4.3	7.8	8.5	9.3	1.3	2.26	7	0.26	0.26	
10-Jan-2011	<QL	5	27.6	38	7.6	8.8	10	11.7	16.7	352	10.3	10.3	
10-Feb-2011	<QL	13.3	20.16	30.66	7.4	8.6	10.8	3.725	5.8	2	<QL	<QL	
10-Mar-2011	<QL	<QL	15.9	35.5	7.9	8.9	10.1	1.1	1.9	1	<QL	<QL	
10-Apr-2011	<QL	<QL	20.3	14.66	7.9	8.7	8.6	3.02	3.93	9	<QL	<QL	
10-May-2011	<QL	<QL	12.75	13.6	8.2	8.8	9	1.5	2.43	18	0.11	0.11	
10-Jun-2011	<QL	<QL	11.8	15.33	8	8.8	8.1	2.2	3	3	<QL	<QL	
10-Jul-2011	<QL	<QL	10	16.6	7.1	8.9	7.5	0.486	1.53	4	<QL	<QL	
10-Aug-2011	<QL	<QL	7.25	12.3	7.9	8.9	7.6	<QL	<QL	1	<QL	<QL	
10-Sep-2011	<QL	<QL	13	15.6	7.5	8.8	7.5	<QL	<QL	1	<QL	<QL	
10-Oct-2011	<QL	<QL	19.38	26	7.2	8.9	7.5	<QL	<QL	2	<QL	<QL	
10-Nov-2011	13	27	25	40.6	7.7	8.9	7.8	<QL	0.86	2	<QL	<QL	
10-Dec-2011	<QL	<QL	11	16.6	7.9	8.7	9.5	<QL	<QL	1	<QL	<QL	
10-Jan-2012	<QL	<QL	17.92	24.33	7.9	8.7	9.7	<QL	<QL	11	<QL	<QL	
10-Feb-2012	<QL	<QL	13.15	21	7.9	8.5	10.6	<QL	<QL	2	<QL	<QL	
10-Mar-2012	<QL	6.33	2.5	4	7.8	8.7	9.9	<QL	<QL	2	0.585	<QL	
10-Apr-2012	<QL	7	5	5	7	8.5	8.23	<QL	<QL	2	0.24	0.24	
10-May-2012	<QL	<QL	2.5	3.6	8.4	8.9	8.3	<QL	<QL	6	<QL	<QL	
10-Jun-2012	<QL	<QL	1.57	2	8.1	8.9	8.1	<QL	<QL	3	<QL	<QL	
10-Jul-2012	<QL	<QL	4.15	8.33	7.9	8.7	7.7	<QL	<QL	2	<QL	<QL	
10-Aug-2012	<QL	<QL	3	4	8.1	8.8	8.1	<QL	<QL	5	<QL	<QL	
10-Sep-2012	<QL	<QL	2.3	3	8.3	8.7	7.9	<QL	<QL	2.82	<QL	<QL	
10-Oct-2012	<QL	<QL	2.5	3.3	8.3	8.8	8.3	<QL	<QL	4	<QL	<QL	
10-Nov-2012	<QL	<QL	2.5	2.3	8.3	8.7	8.6	<QL	<QL	4	<QL	<QL	
10-Dec-2012	<QL	<QL	5	5.3	8.4	8.8	10.2	<QL	<QL	2	<QL	<QL	
10-Jan-2013	<QL	<QL	6.3	12	7.7	8.7	9.7	<QL	<QL	2	<QL	<QL	
10-Feb-2013	1.4	5	6.7	11	7.7	8.4	9.6	<QL	<QL	2	<QL	<QL	
10-Mar-2013	<QL	<QL	8.7	11.3	7.7	8.5	10.6	<QL	<QL	26	<QL	<QL	
10-Apr-2013	<QL	<QL	7.3	8.6	7.9	8.5	10.3	<QL	<QL	19	<QL	<QL	
10-May-2013	<QL	<QL	4	8.9	7.7	8.3	8.9	0.08	0.37	18	<QL	<QL	
10-Jun-2013	<QL	<QL	3.4	4.3	7.7	8.5	7.9	<QL	<QL	1	<QL	<QL	
10-Jul-2013	<QL	<QL	3.87	8.6	7.9	8.5	8	<QL	<QL	3	<QL	<QL	
10-Aug-2013	<QL	<QL	1.75	2	7.4	8.5	7.7	0.33	0.51	4	<QL	<QL	
10-Sep-2013	<QL	<QL	0.95	3.5	7.5	8.5	7.9	0.784	1.69	19	<QL	<QL	
10-Oct-2013	<QL	<QL	<QL	<QL	7.5	8.7	7.9	0.863	1.313	3	<QL	<QL	
10-Nov-2013	<QL	<QL	0.038	1.1	7.6	8.3	8	1.55	2.05	4	<QL	<QL	
10-Dec-2013	<QL	<QL	0.367	1.4	7.9	8.5	9.1	1.4	1.61	7	<QL	<QL	
10-Jan-2014	<QL	<QL	1.4	1.6	7.7	8.5	9.8	0.055	1.237	66	<QL	<QL	
10-Feb-2014	5.5	5.9	7.11	9.333	7.6	8.4	10.8	1.72	2.046	153	<QL	<QL	
10-Mar-2014	7.49	10.53	9.85	12.466	7.5	8.3	10.5	1.901	2.183	40	<QL	<QL	
10-Apr-2014	7.2	11.86	10.35	16.7	7	8.3	8.9	1.791	1.893	98	<QL	<QL	
10-May-2014	5.2	10.6	12.6	14.067	7.6	8.6	9.4	1.509	2.143	84	<QL	<QL	
10-Jun-2014	<QL	<QL	5.8	9.9	7.9	8.7	8	1.53	1.57	18	<QL	<QL	
10-Jul-2014	4.2	6.06	2.866	3.866	8.1	8.6	7.8	1.34	1.39	74	<QL	<QL	
10-Aug-2014	0.4	1.7	2.09	2.63	8	8.9	8.2	1.035	1.19	12	<QL	<QL	68
10-Sep-2014	2.2	8.7	4.86	7.03	8	8.6	8	1.28	2.47	2	<QL	<QL	73
10-Oct-2014	0.9	<QL	4.12	4.77	7.9	8.5	8.1	1.477	2.25	13	<QL	<QL	36
10-Nov-2014	4.3	9.2	4.51	5.57	7.9	8.5	8.3	3.46	6.23	1	<QL	<QL	36
10-Dec-2014	11.3	18.9	11.62	16.53	7.9	8.9	8.7	3.52	5.93	8	1.1	1.1	72
10-Jan-2015	4.9	4.8	6.84	8.13	7.7	8.4	8.7	1.87	1.93	4	<QL	<QL	54
10-Feb-2015	2.6	3.9	7.34	10	7.7	8.3	9.6	1.82	2.06	1	<QL	<QL	93
10-Mar-2015	6.5	7.9	12.31	15.53	7.4	8.3	9.8	1.98	2.75	1	<QL	<QL	130
10-Apr-2015	6	9	8	11	7.5	8.6	8.9	2	2.6	5	<QL	<QL	130
													NH3
LIMITS	7	10	30	45	6	9	7.4	5	7.5	126	2.8	2.8	Jan-May
											1.6	1.6	June-Dec

Moneta Regional WWTP Effluent

	pH	Temp		pH	Temp
8/1/2013	8.5	25.2	10/5/2013	8	24.1
8/2/2013	7.8	25.4	10/6/2013	8.3	24.1
8/3/2013	8.1	25.4	10/7/2013	8	23.4
8/4/2013	7.8	26.6	10/8/2013	8	21.5
8/5/2013	8.1	23.5	10/9/2013	8.3	20.6
8/6/2013	8.2	24.5	10/10/2013	8.2	20.2
8/7/2013	7.9	25.2	10/11/2013	8.3	20.8
8/8/2013	8	25.9	10/12/2013	8	21.2
8/9/2013	8.2	26.2	10/13/2013	8	21.3
8/10/2013	8.1	25.7	10/14/2013	8.1	20.8
8/11/2013	8	27.2	10/15/2013	8.1	19.9
8/12/2013	8.1	27.7	10/16/2013	7.8	21.1
8/13/2013	8	27	10/17/2013	8	21.3
8/14/2013	7.9	26.4	10/18/2013	8.1	19.9
8/15/2013	8.2	25	10/19/2013	7.9	20.1
8/16/2013	8.2	23.8	10/20/2013	7.9	19.8
8/17/2013	8	23.5	10/21/2013	8.1	17.6
8/18/2013	7.7	23.6	10/22/2013	7.9	18.7
8/19/2013	8.1	23.5	10/23/2013	8	18.5
8/20/2013	7.8	24.8	10/24/2013	7.9	16.9
8/21/2013	7.7	24.7	10/25/2013	7.6	15.1
8/22/2013	8.1	24.4	10/26/2013	8.3	14.7
8/23/2013	7.5	24.5	10/27/2013	8.1	16.8
8/24/2013	8.2	25	10/28/2013	8	16.6
8/25/2013	8	24.3	10/29/2013	8.2	17
8/26/2013	7.7	23.3	10/30/2013	7.9	17.5
8/27/2013	7.9	24.1	10/31/2013	8	17.6
8/28/2013	7.7	24	12/1/2013	8.4	9.6
8/29/2013	8.2	24.6	12/2/2013	8.5	8.8
8/30/2013	8.3	26.1	12/3/2013	8.1	10.4
8/31/2013	8.1	25.2	12/4/2013	8.3	11.4
9/1/2013	8.1	25.1	12/5/2013	8.4	12.7
9/2/2013	7.9	24.7	12/6/2013	8.3	15
9/3/2013	8	26	12/7/2013	8.1	13.9
9/4/2013	7.5	24.5	12/8/2013	8.2	11.2
9/5/2013	8	23.9	12/9/2013	8.1	11.9
9/6/2013	7.8	24	12/10/2013	8.3	11.1
9/7/2013	8.1	24.9	12/11/2013	8.2	12.2
9/8/2013	7.6	25.3	12/12/2013	8.3	10.2
9/9/2013	7.5	24.2	12/13/2013	8.2	9.3
9/10/2013	7.7	24.8	12/14/2013	8.4	10.3
9/11/2013	7.8	25.3	12/15/2013	8.4	10.4
9/12/2013	7.7	25.5	12/16/2013	8.4	8.9
9/13/2013	8.2	24.8	12/17/2013	8.4	8.6
9/14/2013	7.9	23.8	12/18/2013	8	9.8
9/15/2013	7.7	23.2	12/19/2013	7.9	10.1
9/16/2013	7.7	23	12/20/2013	8	9.5
9/17/2013	8	22.5	12/21/2013	8.2	10.6
9/18/2013	7.9	22.8	12/22/2013	7.9	12.8
9/19/2013	8	22.5	12/23/2013	8	13.9
9/20/2013	8.1	22.4	12/24/2013	8.1	10.7
9/21/2013	8.2	23.5	12/25/2013	8	9.2
9/22/2013	8.5	23.5	12/26/2013	8	8
9/23/2013	8.3	22.7	12/27/2013	8.1	9.1
9/24/2013	8.2	22.5	12/28/2013	7.9	8.8
9/25/2013	8.4	22	12/29/2013	7.9	9.5
9/26/2013	8.7	22.4	12/30/2013	7.9	11.6
9/27/2013	8.3	21.4	12/31/2013		
9/28/2013	8.7	22.2	1/1/2014	7.8	9.6
9/29/2013	8.4	21.8	1/2/2014	7.9	9.7
9/30/2013	8.3	22	1/3/2014	8.4	7.1
10/1/2013	8.2	22.2	1/4/2014	8.3	6.8
10/2/2013	7.9	21.3	1/5/2014	8.0	7.1
10/3/2013	8	21.9	1/6/2014	8.1	8.8
10/4/2013	7.9	22.9	1/7/2014	8.1	3.2
1/8/2014	8.0	4.8	3/17/2014	8	9.5
1/9/2014	7.9	6.8	3/18/2014	7.8	8.3

	pH	Temp
1/10/2014	7.7	8.8
1/11/2014	7.8	8.3
1/12/2014	8.0	9.5
1/13/2014	7.9	8.0
1/14/2014	7.8	9.5
1/15/2014	8.1	10.4
1/16/2014	8.2	8.2
1/17/2014	7.8	7.7
1/18/2014	7.9	7.5
1/19/2014	8.1	7.4
1/20/2014	8.0	7.7
1/21/2014	7.8	7.5
1/22/2014	8.1	6.9
1/23/2014	7.6	5.9
1/24/2014	7.9	4.1
1/25/2014	7.8	5.1
1/26/2014	7.7	4.7
1/27/2014	8.0	6.0
1/28/2014	8.0	5.3
1/29/2014	8.0	4.4
1/30/2014	7.9	4.6
1/31/2014	8.1	4.6
2/1/2014	7.9	5.5
2/2/2014	7.9	7.2
2/3/2014	7.8	7.9
2/4/2014	7.8	7.7
2/5/2014	8	8.3
2/6/2014	7.8	7.4
2/7/2014	7.9	7.6
2/8/2014	7.9	7.7
2/9/2014	7.6	8.2
2/10/2014	7.7	7.6
2/11/2014	7.7	7.1
2/12/2014	7.8	6.5
2/13/2014	7.8	4.9
2/14/2014	8	5.6
2/15/2014	8.3	7.3
2/16/2014	8.1	6.8
2/17/2014	8	7
2/18/2014	7.9	8.3
2/19/2014	7.9	8.5
2/20/2014	7.8	8.7
2/21/2014	7.8	9.5
2/22/2014	8	9.5
2/23/2014	7.8	9.8
2/24/2014	7.8	9.5
2/25/2014	7.8	8.7
2/26/2014	7.7	8.5
2/27/2014	8	7.7
2/28/2014	7.5	7
3/1/2014	7.6	7.7
3/2/2014	8	9.9
3/3/2014	7.7	9.7
3/4/2014	8	8.2
3/5/2014	8.2	8.5
3/6/2014	7.8	8.5
3/7/2014	7.9	7.1
3/8/2014	8.1	9.2
3/9/2014	8.3	9.9
3/10/2014	7.9	9
3/11/2014	8.2	9.8
3/12/2014	8	10.9
3/13/2014	7.9	10.6
3/14/2014	8	10.9
3/15/2014	8	11.9
3/16/2014	7.9	11.7
5/24/2014	8.3	21.2
5/25/2014	8.1	20.7
5/26/2014	8.1	23.6

	pH	Temp
3/19/2014	7	11.4
3/20/2014	8.3	9.6
3/21/2014	8.1	9.9
3/22/2014	8.1	11.2
3/23/2014	8.1	11.2
3/24/2014	8.2	11.2
3/25/2014	8.1	10.5
3/26/2014	7.8	9.2
3/27/2014	8.3	8.3
3/28/2014	7.9	11.3
3/29/2014	8.2	11.2
3/30/2014	7.8	11.4
3/31/2014	7.6	11.2
4/1/2014	7.6	12
4/2/2014	7.6	13.7
4/3/2014	8	14.9
4/4/2014	7.9	15.2
4/5/2014	8.1	14.2
4/6/2014	8	13.4
4/7/2014	7.9	13.8
4/8/2014	8.1	13.6
4/9/2014	7.9	14.9
4/10/2014	8.1	15.2
4/11/2014	7.8	15.5
4/12/2014	8.1	15.5
4/13/2014	8.1	16.8
4/14/2014	8.1	17.5
4/15/2014	8.3	17.1
4/16/2014	8	14
4/17/2014	8.2	14.8
4/18/2014	8.2	14.9
4/19/2014	8.4	15.2
4/20/2014	8.3	15.3
4/21/2014	8.4	14.7
4/22/2014	8.1	16.3
4/23/2014	8.1	15.3
4/24/2014	8.6	15.3
4/25/2014	8.2	15.5
4/26/2014	8.4	15.8
4/27/2014	8.4	16.8
4/28/2014	8.3	16.9
4/29/2014	8.2	15.8
4/30/2014	8	16.1
5/1/2014	8.3	17.9
5/2/2014	8.2	17.1
5/3/2014	8.6	17.8
5/4/2014	8.4	17.5
5/5/2014	8.2	17.9
5/6/2014	8.3	17.4
5/7/2014	8.1	16.8
5/8/2014	8.2	16.8
5/9/2014	8.7	19
5/10/2014	8.4	20.6
5/11/2014	8.4	20.3
5/12/2014	8.3	21.5
5/13/2014	8.3	22.7
5/14/2014	8.3	22.1
5/15/2014	8.5	21.6
5/16/2014	8.4	20.1
5/17/2014	8.3	19.3
5/18/2014	8	18.4
5/19/2014	8.1	19.9
5/20/2014	8.3	18.8
5/21/2014	8.3	19.2
5/22/2014	8.2	22.2
5/23/2014	8.2	21.6

	pH	Temp		pH	Temp
5/27/2014	7.9	22.7			
5/28/2014	7.9	21.8			
5/29/2014	8.4	22.5			
5/30/2014	8.3	21.5			
5/31/2014	8.5	23.3			
6/1/2014	8.5	22.7			
6/2/2014	8.4	21.4			
6/3/2014					
6/4/2014	8.4	23			
6/5/2014	8.4	23.2			
6/6/2014	8.5	23.1			
6/7/2014	8.3	22.4			
6/8/2014	8.3	22.4			
6/9/2014	8.3	22.6			
6/10/2014	8.4	23.1			
6/11/2014	8.4	23.2			
6/12/2014	8.3	23.2			
6/13/2014	8.3	23.6			
6/14/2014	8.3	23.5			
6/15/2014	8.1	24.7			
6/16/2014	8.3	23.3			
6/17/2014	8.1	23.9			
6/18/2014	8.4	23.8			
6/19/2014	8.5	24.9			
6/20/2014	8.1	24.2			
6/21/2014	8.4	25.9			
6/22/2014	8.5	26			
6/23/2014	8.6	24.1			
6/24/2014	8.3	24.9			
6/25/2014	8.2	24			
6/26/2014	8.5	24.6			
6/27/2014	8.6	24.9			
6/28/2014	8.5	24.7			
6/29/2014	8.2	24.7			
6/30/2014	8.3	24.3			
7/1/2014	8.7	25.5			
7/2/2014	8.6	26.2			
7/3/2014	8.5	25.3			
7/4/2014	8.3	24.1			
7/5/2014	8.4	24			
7/6/2014	8.4	23.9			
7/7/2014	8.3	23.6			
7/8/2014	8	25.4			
7/9/2014	8.1	25.4			
7/10/2014	8.2	24.6			
7/11/2014	8.1	24.6			
7/12/2014	8.2	24.8			
7/13/2014	8.3	25			
7/14/2014	8.3	25			
7/15/2014	8.2	25.7			
7/16/2014	8.3	24.8			
7/17/2014	8.1	24.5			
7/18/2014	8	24.4			
7/19/2014	8	24			
7/20/2014	8.2	23.6			
7/21/2014	8	23.3			
7/22/2014	8.4	25.8			
7/23/2014	8.2	25			
7/24/2014	8.2	25.4			
7/25/2014	8.6	24.8			
7/26/2014	8.2	25.6			
7/27/2014	8.3	25.5			
7/28/2014	8.9	24.3			
7/29/2014	8.2	23.8			
7/30/2014	8.2	23.7			
7/31/2014	8.3	24.4			
	8.4	**25.0**	90%tile annual		
	7.8		10%tile annual		

Moneta Regional WWTP Effluent
High Flow Months (Jan-May)

	pH	Temp		pH	Temp
1/1/2014	7.8	9.6	2/13/2014	7.8	4.9
1/2/2014	7.9	9.7	2/14/2014	8	5.6
1/3/2014	8.4	7.1	2/15/2014	8.3	7.3
1/4/2014	8.3	6.8	2/16/2014	8.1	6.8
1/5/2014	8.0	7.1	2/17/2014	8	7
1/6/2014	8.1	8.8	2/18/2014	7.9	8.3
1/7/2014	8.1	3.2	2/19/2014	7.9	8.5
1/8/2014	8.0	4.8	2/20/2014	7.8	8.7
1/9/2014	7.9	6.8	2/21/2014	7.8	9.5
1/10/2014	7.7	8.8	2/22/2014	8	9.5
1/11/2014	7.8	8.3	2/23/2014	7.8	9.8
1/12/2014	8.0	9.5	2/24/2014	7.8	9.5
1/13/2014	7.9	8.0	2/25/2014	7.8	8.7
1/14/2014	7.8	9.5	2/26/2014	7.7	8.5
1/15/2014	8.1	10.4	2/27/2014	8	7.7
1/16/2014	8.2	8.2	2/28/2014	7.5	7
1/17/2014	7.8	7.7	3/1/2014	7.6	7.7
1/18/2014	7.9	7.5	3/2/2014	8	9.9
1/19/2014	8.1	7.4	3/3/2014	7.7	9.7
1/20/2014	8.0	7.7	3/4/2014	8	8.2
1/21/2014	7.8	7.5	3/5/2014	8.2	8.5
1/22/2014	8.1	6.9	3/6/2014	7.8	8.5
1/23/2014	7.6	5.9	3/7/2014	7.9	7.1
1/24/2014	7.9	4.1	3/8/2014	8.1	9.2
1/25/2014	7.8	5.1	3/9/2014	8.3	9.9
1/26/2014	7.7	4.7	3/10/2014	7.9	9
1/27/2014	8.0	6.0	3/11/2014	8.2	9.8
1/28/2014	8.0	5.3	3/12/2014	8	10.9
1/29/2014	8.0	4.4	3/13/2014	7.9	10.6
1/30/2014	7.9	4.6	3/14/2014	8	10.9
1/31/2014	8.1	4.6	3/15/2014	8	11.9
2/1/2014	7.9	5.5	3/16/2014	7.9	11.7
2/2/2014	7.9	7.2	3/17/2014	8	9.5
2/3/2014	7.8	7.9	3/18/2014	7.8	8.3
2/4/2014	7.8	7.7	3/19/2014	7	11.4
2/5/2014	8	8.3	3/20/2014	8.3	9.6
2/6/2014	7.8	7.4	3/21/2014	8.1	9.9
2/7/2014	7.9	7.6	3/22/2014	8.1	11.2
2/8/2014	7.9	7.7	3/23/2014	8.1	11.2
2/9/2014	7.6	8.2	3/24/2014	8.2	11.2
2/10/2014	7.7	7.6	3/25/2014	8.1	10.5
2/11/2014	7.7	7.1	3/26/2014	7.8	9.2
2/12/2014	7.8	6.5	3/27/2014	8.3	8.3

3/28/2014	7.9	11.3	
3/29/2014	8.2	11.2	
3/30/2014	7.8	11.4	
3/31/2014	7.6	11.2	
4/1/2014	7.6	12	
4/2/2014	7.6	13.7	
4/3/2014	8	14.9	
4/4/2014	7.9	15.2	
4/5/2014	8.1	14.2	
4/6/2014	8	13.4	
4/7/2014	7.9	13.8	
4/8/2014	8.1	13.6	
4/9/2014	7.9	14.9	
4/10/2014	8.1	15.2	
4/11/2014	7.8	15.5	
4/12/2014	8.1	15.5	
4/13/2014	8.1	16.8	
4/14/2014	8.1	17.5	
4/15/2014	8.3	17.1	
4/16/2014	8	14	
4/17/2014	8.2	14.8	
4/18/2014	8.2	14.9	
4/19/2014	8.4	15.2	
4/20/2014	8.3	15.3	
4/21/2014	8.4	14.7	
4/22/2014	8.1	16.3	
4/23/2014	8.1	15.3	
4/24/2014	8.6	15.3	
4/25/2014	8.2	15.5	
4/26/2014	8.4	15.8	
4/27/2014	8.4	16.8	
4/28/2014	8.3	16.9	
4/29/2014	8.2	15.8	
4/30/2014	8	16.1	
5/1/2014	8.3	17.9	
5/2/2014	8.2	17.1	
5/3/2014	8.6	17.8	
5/4/2014	8.4	17.5	
5/5/2014	8.2	17.9	
5/6/2014	8.3	17.4	
5/7/2014	8.1	16.8	
5/8/2014	8.2	16.8	
5/9/2014	8.7	19	
5/10/2014	8.4	20.6	
5/11/2014	8.4	20.3	
5/12/2014	8.3	21.5	
5/13/2014	8.3	22.7	
5/14/2014	8.3	22.1	
5/15/2014	8.5	21.6	
5/16/2014	8.4	20.1	
5/17/2014	8.3	19.3	
5/18/2014	8	18.4	
5/19/2014	8.1	19.9	
5/20/2014	8.3	18.8	
5/21/2014	8.3	19.2	
5/22/2014	8.2	22.2	
5/23/2014	8.2	21.6	
5/24/2014	8.3	21.2	
5/25/2014	8.1	20.7	
5/26/2014	8.1	23.6	
5/27/2014	7.9	22.7	
5/28/2014	7.9	21.8	
5/29/2014	8.4	22.5	
5/30/2014	8.3	21.5	
5/31/2014	8.5	23.3	
		20.3	90%tile

Moneta Regional WWTP
Hardness (mg/l as CaCO3)

Date	Effluent	Stream
6/17/2013	134	57
5/29/2013	139	49.6
9/12/2013	111	53
Average	128	53.2

Moneta Regional WWTP "Suitable" Metals Data

	Total Zinc µg/l	Diss Zinc µg/l	Total Cu µg/l	Diss Cu µg/l	Total Ni µg/l	Diss Ni µg/l	Total Sb µg/l	Diss Sb µg/l
6/5/2012		34.1		18.1		5.19		0.8
1/3/2013	76	62						
1/18/2013	75	63						
1/31/2013	105	74						
2/14/2013	83	65						
2/28/2013	91	73						
5/29/2013	88	76	25	22	7	7.2	<1	<1
8/27/2013	52	48	15	14	<5	<5	<1	<1

Moneta Regional WWTP PCB Data

**** Censored ****

Compared to largest

Summary	**Uncensored tPCB unadj (pg/L)**	**tPCB adj (pg/L)**	**OPR (ok)**	**Extraction, Cleanup & Injection stds (ok)**	
VA0091669 Effluent 1 6/5/12	**1505.058**	1471.322		ok	
Dup VA0091669 Effluent 2 6/5/12	**1557.029**	1519.741		ok	
Eff 3	**0**	0			
Eff 4	**0**	0			
Eff 5	**0**	0	ok		
Method Blank	**33.042**			ok	
BED_ME FB1 6/5/12	**49.267**			ok	

*Only applicable if Field or Rinsate Blank collected

average value: 1495.5315

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to HUNTING CREEK.

File Information

File Name:	C:\reference files\wise\Moneta WWTP\DO Model Run 1.mod
Date Modified:	April 12, 2010

Water Quality Standards Information

Stream Name:	HUNTING CREEK
River Basin:	Roanoke River Basin
Section:	5a
Class:	III - Nontidal Waters (Coastal and Piedmont)
Special Standards:	PWS

Background Flow Information

Gauge Used:	Tinker Creek near Dalevill, VA
Gauge Drainage Area:	11.7 Sq.Mi.
Gauge 7Q10 Flow:	0.6463 MGD
Headwater Drainage Area:	1.54 Sq.Mi.
Headwater 7Q10 Flow:	8.506855E-02 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	0 MGD
Incremental Flow in Segments:	5.523932E-02 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	23.3 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	7.500544 mg/l

Model Segmentation

Number of Segments:	1
Model Start Elevation:	802 ft above MSL
Model End Elevation:	755 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to HUNTING CREEK.

Segment Information for Segment 1

Definition Information	
Segment Definition:	A discharge enters.
Discharge Name:	MONETA REGIONAL WWTP
VPDES Permit No.:	
Discharger Flow Information	
Flow:	0.5 MGD
cBOD5:	7 mg/l
TKN:	5 mg/l
D.O.:	7.3 mg/l
Temperature:	23.6 Degrees C
Geographic Information	
Segment Length:	1.1 miles
Upstream Drainage Area:	1.54 Sq.Mi.
Downstream Drainage Area:	0 Sq.Mi.
Upstream Elevation:	802 Ft.
Downstream Elevation:	755 Ft.
Hydraulic Information	
Segment Width:	6 Ft.
Segment Depth:	0.48 Ft.
Segment Velocity:	0.458 Ft./Sec.
Segment Flow:	0.585 MGD
Incremental Flow:	-0.085 MGD (Applied at end of segment.)
Channel Information	
Cross Section:	Rectangular
Character:	Moderately Meandering
Pool and Riffle:	Yes
Percent Pools:	40
Percent Riffles:	60
Pool Depth:	0.75 Ft.
Riffle Depth:	0.3 Ft.
Bottom Type:	Small Rock
Sludge:	None
Plants:	None
Algae:	None

"Model Run For C:\reference files\wise\Moneta WWTP\DO Model Run 1.mod On 4/12/2010 6:27:04 PM"

"Model is for HUNTING CREEK."
"Model starts at the MONETA REGIONAL WWTP discharge."

"Background Data"

"7Q10",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.0851,	2,	0,	7.501,	23.3

"Discharge/Tributary Input Data for Segment 1"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.5,	7,	5,	,7.3,	23.6

"Hydraulic Information for Segment 1"

"Length",	"Width",	"Depth",	"Velocity"
"(mi)",	"(ft)",	"(ft)",	"(ft/sec)"
1.1,	6,	.48,	.458

"Initial Mix Values for Segment 1"

"Flow",	"DO",	"cBOD",	"nBOD",	"DOSat",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.5851,	7.329,	15.683,	7.401,	8.305,	23.55638

"Rate Constants for Segment 1. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
1,	1.177,	20,	21.76,	.4,	.526,	0,	0

"Output for Segment 1"
"Segment starts at MONETA REGIONAL WWTP"

"Total",	"Segm."			
"Dist.",	"Dist.",	"DO",	"cBOD",	"nBOD"
"(mi)",	"(mi)",	"(mg/l)",	"(mg/l)",	"(mg/l)"
0,	0,	7.329,	15.683,	7.401
.1,	.1,	7.318,	15.439,	7.349
.2,	.2,	7.313,	15.198,	7.298
.3,	.3,	7.313,	14.961,	7.247
.4,	.4,	7.317,	14.728,	7.196
.5,	.5,	7.323,	14.498,	7.146
.6,	.6,	7.331,	14.272,	7.096
.7,	.7,	7.34,	14.05,	7.046
.8,	.8,	7.35,	13.831,	6.997
.9,	.9,	7.361,	13.615,	6.948
1,	1,	7.373,	13.403,	6.899
1.1,	1.1,	7.385,	13.194,	6.851

"END OF FILE"

Mixing Zone Predictions for Moneta Regional WWTP

Effluent Flow = 0.5 MGD
Stream 7Q10 = 0.088 MGD
Stream 30Q10 = 0.107 MGD
Stream 1Q10 = 0.083 MGD
Stream slope = 0.001 ft/ft
Stream width = 6 ft
Bottom scale = 3
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .5754 ft
Length = 32.32 ft
Velocity = .2636 ft/sec
Residence Time = .0014 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .5872 ft
Length = 31.7 ft
Velocity = .2666 ft/sec
Residence Time = .0014 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .5723 ft
Length = 32.48 ft
Velocity = .2628 ft/sec
Residence Time = .0343 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Moneta Regional WWTP   Permit No.: VA0091669

Receiving Stream: Hunting Creek   Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information	
Mean Hardness (as CaCO3) =	53.2 mg/L
90% Temperature (Annual) =	23.3 deg C
90% Temperature (Wet season) =	17.1 deg C
90% Maximum pH =	8.6 SU
10% Maximum pH =	7 SU
Tier Designation (1 or 2) =	2
Public Water Supply (PWS) Y/N? =	y
Trout Present Y/N? =	n
Early Life Stages Present Y/N? =	y

Stream Flows	
1Q10 (Annual) =	0.083 MGD
7Q10 (Annual) =	0.088 MGD
30Q10 (Annual) =	0.107 MGD
1Q10 (Wet season) =	0.196 MGD
30Q10 (Wet season)	0.272 MGD
30Q5 =	0.143 MGD
Harmonic Mean =	0.425 MGD

Mixing Information	
Annual - 1Q10 Mix =	100 %
- 7Q10 Mix =	100 %
- 30Q10 Mix =	100 %
Wet Season - 1Q10 Mix =	100 %
- 30Q10 Mix =	100 %

Effluent Information	
Mean Hardness (as CaCO3) =	128 mg/L
90% Temp (Annual) =	25 deg C
90% Temp (Wet season) =	20.3 deg C
90% Maximum pH =	8.4 SU
10% Maximum pH =	7.8 SU
Discharge Flow =	0.5 MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	5	--	--	6.7E+02	9.9E+02	--	--	8.6E+02	1.3E+03	--	--	7.2E+01	1.0E+02	--	--	9.1E+01	1.3E+02	--	--	**9.1E+01**	**1.3E+02**
Acrolein	0	--	--	6.1E+00	9.3E+00	--	--	7.8E+00	1.2E+01	--	--	6.1E-01	9.3E-01	--	--	7.8E-01	1.2E+00	--	--	**7.8E-01**	**1.2E+00**
Acrylonitrile[c]	0	--	--	5.1E-01	2.5E+00	--	--	9.4E-01	4.6E+00	--	--	5.1E-02	2.5E-01	--	--	9.4E-02	4.6E-01	--	--	**9.4E-02**	**4.6E-01**
Aldrin [c]	0	3.0E+00	--	4.9E-04	5.0E-04	3.5E+00	--	9.1E-04	9.3E-04	7.5E-01	--	4.9E-05	5.0E-05	8.7E-01	--	9.1E-05	9.3E-05	**8.7E-01**	--	**9.1E-05**	**9.3E-05**
Ammonia-N (mg/l) (Yearly)	0	3.71E+00	6.37E-01	--	--	4.33E+00	7.73E-01	--	--	9.28E-01	1.59E-01	--	--	1.08E+00	1.93E-01	--	--	**1.08E+00**	**1.93E-01**	--	--
Ammonia-N (mg/l) (High Flow)	0	3.54E+00	8.63E-01	--	--	4.93E+00	1.33E+00	--	--	8.85E-01	2.16E-01	--	--	1.23E+00	3.33E-01	--	--	**1.23E+00**	**3.33E-01**	--	--
Anthracene	0	--	--	8.3E+03	4.0E+04	--	--	1.1E+04	5.1E+04	--	--	8.3E+02	4.0E+03	--	--	1.1E+03	5.1E+03	--	--	**1.1E+03**	**5.1E+03**
Antimony	0	--	--	5.6E+00	6.4E+02	--	--	7.2E+00	8.2E+02	--	--	5.6E-01	6.4E+01	--	--	7.2E-01	8.2E+01	--	--	**7.2E-01**	**8.2E+01**
Arsenic	0	3.4E+02	1.5E+02	1.0E+01	--	4.0E+02	1.8E+02	1.3E+01	--	8.5E+01	3.8E+01	1.0E+00	--	9.9E+01	4.4E+01	1.3E+00	--	**9.9E+01**	**4.4E+01**	**1.3E+00**	--
Barium	0	--	--	2.0E+03	--	--	--	2.6E+03	--	--	--	2.0E+02	--	--	--	2.6E+02	--	--	--	**2.6E+02**	--
Benzene [c]	0	--	--	2.2E+01	5.1E+02	--	--	4.1E+01	9.4E+02	--	--	2.2E+00	5.1E+01	--	--	4.1E+00	9.4E+01	--	--	**4.1E+00**	**9.4E+01**
Benzidine[c]	0	--	--	8.6E-04	2.0E-03	--	--	1.6E-03	3.7E-03	--	--	8.6E-05	2.0E-04	--	--	1.6E-04	3.7E-04	--	--	**1.6E-04**	**3.7E-04**
Benzo (a) anthracene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	**7.0E-03**	**3.3E-02**
Benzo (b) fluoranthene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	**7.0E-03**	**3.3E-02**
Benzo (k) fluoranthene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	**7.0E-03**	**3.3E-02**
Benzo (a) pyrene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	**7.0E-03**	**3.3E-02**
Bis2-Chloroethyl Ether [c]	0	--	--	3.0E-01	5.3E+00	--	--	5.6E-01	9.8E+00	--	--	3.0E-02	5.3E-01	--	--	5.6E-02	9.8E-01	--	--	**5.6E-02**	**9.8E-01**
Bis2-Chloroisopropyl Ether	0	--	--	1.4E+03	6.5E+04	--	--	1.8E+03	8.4E+04	--	--	1.4E+02	6.5E+03	--	--	1.8E+02	8.4E+03	--	--	**1.8E+02**	**8.4E+03**
Bis 2-Ethylhexyl Phthalate [c]	0	--	--	1.2E+01	2.2E+01	--	--	2.2E+01	4.1E+01	--	--	1.2E+00	2.2E+00	--	--	2.2E+00	4.1E+00	--	--	**2.2E+00**	**4.1E+00**
Bromoform [c]	0	--	--	4.3E+01	1.4E+03	--	--	8.0E+01	2.6E+03	--	--	4.3E+00	1.4E+02	--	--	8.0E+00	2.6E+02	--	--	**8.0E+00**	**2.6E+02**
Butylbenzylphthalate	0	--	--	1.5E+03	1.9E+03	--	--	1.9E+03	2.4E+03	--	--	1.5E+02	1.9E+02	--	--	1.9E+02	2.4E+02	--	--	**1.9E+02**	**2.4E+02**
Cadmium	0	4.7E+00	1.3E+00	5.0E+00	--	5.5E+00	1.5E+00	6.4E+00	--	1.2E+00	3.2E-01	5.0E-01	--	1.4E+00	3.8E-01	6.4E-01	--	**1.4E+00**	**3.8E-01**	**6.4E-01**	--
Carbon Tetrachloride [c]	0	--	--	2.3E+00	1.6E+01	--	--	4.3E+00	3.0E+01	--	--	2.3E-01	1.6E+00	--	--	4.3E-01	3.0E+00	--	--	**4.3E-01**	**3.0E+00**
Chlordane [c]	0	2.4E+00	4.3E-03	8.0E-03	8.1E-03	2.8E+00	5.1E-03	1.5E-02	1.5E-02	6.0E-01	1.1E-03	8.0E-04	8.1E-04	7.0E-01	1.3E-03	1.5E-03	1.5E-03	**7.0E-01**	**1.3E-03**	**1.5E-03**	**1.5E-03**
Chloride	0	8.6E+05	2.3E+05	2.5E+05	--	1.0E+06	2.7E+05	3.2E+05	--	2.2E+05	5.8E+04	2.5E+04	--	2.5E+05	6.8E+04	3.2E+04	--	**2.5E+05**	**6.8E+04**	**3.2E+04**	--
TRC	0	1.9E+01	1.1E+01	--	--	2.2E+01	1.3E+01	--	--	4.8E+00	2.8E+00	--	--	5.5E+00	3.2E+00	--	--	**5.5E+00**	**3.2E+00**	--	--
Chlorobenzene	0	--	--	1.3E+02	1.6E+03	--	--	1.7E+02	2.1E+03	--	--	1.3E+01	1.6E+02	--	--	1.7E+01	2.1E+02	--	--	**1.7E+01**	**2.1E+02**
Chlorodibromomethane[c]	0	--	--	4.0E+00	1.3E+02	--	--	7.4E+00	2.4E+02	--	--	4.0E-01	1.3E+01	--	--	7.4E-01	2.4E+01	--	--	**7.4E-01**	**2.4E+01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chloroform	0	--	--	3.4E+02	1.1E+04	--	--	4.4E+02	1.4E+04	--	--	3.4E+01	1.1E+03	--	--	4.4E+01	1.4E+03	--	--	4.4E+01	1.4E+03
2-Chloronaphthalene	0	--	--	1.0E+03	1.6E+03	--	--	1.3E+03	2.1E+03	--	--	1.0E+02	1.6E+02	--	--	1.3E+02	2.1E+02	--	--	1.3E+02	2.1E+02
2-Chlorophenol	0	--	--	8.1E+01	1.5E+02	--	--	1.0E+02	1.9E+02	--	--	8.1E+00	1.5E+01	--	--	1.0E+01	1.9E+01	--	--	1.0E+01	1.9E+01
Chlorpyrifos	0	8.3E-02	4.1E-02	--	--	9.7E-02	4.8E-02	--	--	2.1E-02	1.0E-02	--	--	2.4E-02	1.2E-02	--	--	2.4E-02	1.2E-02	--	--
Chromium III	0	6.5E+02	8.4E+01	--	--	7.6E+02	9.9E+01	--	--	1.6E+02	2.1E+01	--	--	1.9E+02	2.5E+01	--	--	1.9E+02	2.5E+01	--	--
Chromium VI	0	1.6E+01	1.1E+01	--	--	1.9E+01	1.3E+01	--	--	4.0E+00	2.8E+00	--	--	4.7E+00	3.2E+00	--	--	4.7E+00	3.2E+00	--	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	1.3E+02	--	--	--	1.0E+01	--	--	--	1.3E+01	--	--	--	1.3E+01	--
Chrysene [c]	0	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	3.8E-04	1.8E-03	--	--	7.0E-04	3.3E-03	--	--	7.0E-04	3.3E-03
Copper	0	1.6E+01	1.0E+01	1.3E+03	--	1.8E+01	1.2E+01	1.7E+03	--	3.9E+00	2.6E+00	1.3E+02	--	4.6E+00	3.0E+00	1.7E+02	--	4.6E+00	3.0E+00	1.7E+02	--
Cyanide, Free	0	2.2E+01	5.2E+00	1.4E+02	1.6E+04	2.6E+01	6.1E+00	1.8E+02	2.1E+04	5.5E+00	1.3E+00	1.4E+01	1.6E+03	6.4E+00	1.5E+00	1.8E+01	2.1E+03	6.4E+00	1.5E+00	1.8E+01	2.1E+03
DDD [c]	0	--	--	3.1E-03	3.1E-03	--	--	5.7E-03	5.7E-03	--	--	3.1E-04	3.1E-04	--	--	5.7E-04	5.7E-04	--	--	5.7E-04	5.7E-04
DDE [c]	0	--	--	2.2E-03	2.2E-03	--	--	4.1E-03	4.1E-03	--	--	2.2E-04	2.2E-04	--	--	4.1E-04	4.1E-04	--	--	4.1E-04	4.1E-04
DDT [c]	0	1.1E+00	1.0E-03	2.2E-03	2.2E-03	1.3E+00	1.2E-03	4.1E-03	4.1E-03	2.8E-01	2.5E-04	2.2E-04	2.2E-04	3.2E-01	2.9E-04	4.1E-04	4.1E-04	3.2E-01	2.9E-04	4.1E-04	4.1E-04
Demeton	0	--	1.0E-01	--	--	--	1.2E-01	--	--	--	2.5E-02	--	--	--	2.9E-02	--	--	--	2.9E-02	--	--
Diazinon	0	1.7E-01	1.7E-01	--	--	2.0E-01	2.0E-01	--	--	4.3E-02	4.3E-02	--	--	5.0E-02	5.0E-02	--	--	5.0E-02	5.0E-02	--	--
Dibenz(a,h)anthracene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	--	--	7.0E-03	3.3E-02
1,2-Dichlorobenzene	0	--	--	4.2E+02	1.3E+03	--	--	5.4E+02	1.7E+03	--	--	4.2E+01	1.3E+02	--	--	5.4E+01	1.7E+02	--	--	5.4E+01	1.7E+02
1,3-Dichlorobenzene	0	--	--	3.2E+02	9.6E+02	--	--	4.1E+02	1.2E+03	--	--	3.2E+01	9.6E+01	--	--	4.1E+01	1.2E+02	--	--	4.1E+01	1.2E+02
1,4-Dichlorobenzene	0	--	--	6.3E+01	1.9E+02	--	--	8.1E+01	2.4E+02	--	--	6.3E+00	1.9E+01	--	--	8.1E+00	2.4E+01	--	--	8.1E+00	2.4E+01
3,3-Dichlorobenzidine[c]	0	--	--	2.1E-01	2.8E-01	--	--	3.9E-01	5.2E-01	--	--	2.1E-02	2.8E-02	--	--	3.9E-02	5.2E-02	--	--	3.9E-02	5.2E-02
Dichlorobromomethane [c]	0	--	--	5.5E+00	1.7E+02	--	--	1.0E+01	3.1E+02	--	--	5.5E-01	1.7E+01	--	--	1.0E+00	3.1E+01	--	--	1.0E+00	3.1E+01
1,2-Dichloroethane [c]	0	--	--	3.8E+00	3.7E+02	--	--	7.0E+00	6.8E+02	--	--	3.8E-01	3.7E+01	--	--	7.0E-01	6.8E+01	--	--	7.0E-01	6.8E+01
1,1-Dichloroethylene	0	--	--	3.3E+02	7.1E+03	--	--	4.2E+02	9.1E+03	--	--	3.3E+01	7.1E+02	--	--	4.2E+01	9.1E+02	--	--	4.2E+01	9.1E+02
1,2-trans-dichloroethylene	0	--	--	1.4E+02	1.0E+04	--	--	1.8E+02	1.3E+04	--	--	1.4E+01	1.0E+03	--	--	1.8E+01	1.3E+03	--	--	1.8E+01	1.3E+03
2,4-Dichlorophenol	0	--	--	7.7E+01	2.9E+02	--	--	9.9E+01	3.7E+02	--	--	7.7E+00	2.9E+01	--	--	9.9E+00	3.7E+01	--	--	9.9E+00	3.7E+01
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	1.0E+02	--	--	--	1.3E+02	--	--	--	1.0E+01	--	--	--	1.3E+01	--	--	--	1.3E+01	--
1,2-Dichloropropane[c]	0	--	--	5.0E+00	1.5E+02	--	--	9.3E+00	2.8E+02	--	--	5.0E-01	1.5E+01	--	--	9.3E-01	2.8E+01	--	--	9.3E-01	2.8E+01
1,3-Dichloropropene [c]	0	--	--	3.4E+00	2.1E+02	--	--	6.3E+00	3.9E+02	--	--	3.4E-01	2.1E+01	--	--	6.3E-01	3.9E+01	--	--	6.3E-01	3.9E+01
Dieldrin [c]	0	2.4E-01	5.6E-02	5.2E-04	5.4E-04	2.8E-01	6.6E-02	9.6E-04	1.0E-03	6.0E-02	1.4E-02	5.2E-05	5.4E-05	7.0E-02	1.6E-02	9.6E-05	1.0E-04	7.0E-02	1.6E-02	9.6E-05	1.0E-04
Diethyl Phthalate	0	--	--	1.7E+04	4.4E+04	--	--	2.2E+04	5.7E+04	--	--	1.7E+03	4.4E+03	--	--	2.2E+03	5.7E+03	--	--	2.2E+03	5.7E+03
2,4-Dimethylphenol	0	--	--	3.8E+02	8.5E+02	--	--	4.9E+02	1.1E+03	--	--	3.8E+01	8.5E+01	--	--	4.9E+01	1.1E+02	--	--	4.9E+01	1.1E+02
Dimethyl Phthalate	0	--	--	2.7E+05	1.1E+06	--	--	3.5E+05	1.4E+06	--	--	2.7E+04	1.1E+05	--	--	3.5E+04	1.4E+05	--	--	3.5E+04	1.4E+05
Di-n-Butyl Phthalate	0	--	--	2.0E+03	4.5E+03	--	--	2.6E+03	5.8E+03	--	--	2.0E+02	4.5E+02	--	--	2.6E+02	5.8E+02	--	--	2.6E+02	5.8E+02
2,4 Dinitrophenol	0	--	--	6.9E+01	5.3E+03	--	--	8.9E+01	6.8E+03	--	--	6.9E+00	5.3E+02	--	--	8.9E+00	6.8E+02	--	--	8.9E+00	6.8E+02
2-Methyl-4,6-Dinitrophenol	0	--	--	1.3E+01	2.8E+02	--	--	1.7E+01	3.6E+02	--	--	1.3E+00	2.8E+01	--	--	1.7E+00	3.6E+01	--	--	1.7E+00	3.6E+01
2,4-Dinitrotoluene [c]	0	--	--	1.1E+00	3.4E+01	--	--	2.0E+00	6.3E+01	--	--	1.1E-01	3.4E+00	--	--	2.0E-01	6.3E+00	--	--	2.0E-01	6.3E+00
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	5.0E-08	5.1E-08	--	--	6.4E-08	6.6E-08	--	--	5.0E-09	5.1E-09	--	--	6.4E-09	6.6E-09	--	--	6.4E-09	6.6E-09
1,2-Diphenylhydrazine[c]	0	--	--	3.6E-01	2.0E+00	--	--	6.7E-01	3.7E+00	--	--	3.6E-02	2.0E-01	--	--	6.7E-02	3.7E-01	--	--	6.7E-02	3.7E-01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	2.6E-01	6.6E-02	8.0E+01	1.1E+02	5.5E-02	1.4E-02	6.2E+00	8.9E+00	6.4E-02	1.6E-02	8.0E+00	1.1E+01	6.4E-02	1.6E-02	8.0E+00	1.1E+01
Beta-Endosulfan	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	2.6E-01	6.6E-02	8.0E+01	1.1E+02	5.5E-02	1.4E-02	6.2E+00	8.9E+00	6.4E-02	1.6E-02	8.0E+00	1.1E+01	6.4E-02	1.6E-02	8.0E+00	1.1E+01
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.6E-01	6.6E-02	--	--	5.5E-02	1.4E-02	--	--	6.4E-02	1.6E-02	--	--	6.4E-02	1.6E-02	--	--
Endosulfan Sulfate	0	--	--	6.2E+01	8.9E+01	--	--	8.0E+01	1.1E+02	--	--	6.2E+00	8.9E+00	--	--	8.0E+00	1.1E+01	--	--	8.0E+00	1.1E+01
Endrin	0	8.6E-02	3.6E-02	5.9E-02	6.0E-02	1.0E-01	4.2E-02	7.6E-02	7.7E-02	2.2E-02	9.0E-03	5.9E-03	6.0E-03	2.5E-02	1.1E-02	7.6E-03	7.7E-03	2.5E-02	1.1E-02	7.6E-03	7.7E-03
Endrin Aldehyde	0	--	--	2.9E-01	3.0E-01	--	--	3.7E-01	3.9E-01	--	--	2.9E-02	3.0E-02	--	--	3.7E-02	3.9E-02	--	--	3.7E-02	3.9E-02
Ethylbenzene	0	--	--	5.3E+02	2.1E+03	--	--	6.8E+02	2.7E+03	--	--	5.3E+01	2.1E+02	--	--	6.8E+01	2.7E+02	--	--	6.8E+01	2.7E+02
Fluoranthene	0	--	--	1.3E+02	1.4E+02	--	--	1.7E+02	1.8E+02	--	--	1.3E+01	1.4E+01	--	--	1.7E+01	1.8E+01	--	--	1.7E+01	1.8E+01
Fluorene	0	--	--	1.1E+03	5.3E+03	--	--	1.4E+03	6.8E+03	--	--	1.1E+02	5.3E+02	--	--	1.4E+02	6.8E+02	--	--	1.4E+02	6.8E+02
Foaming Agents	0	--	--	5.0E+02	--	--	--	6.4E+02	--	--	--	5.0E+01	--	--	--	6.4E+01	--	--	--	6.4E+01	--

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Guthion	0	--	1.0E-02	--	--	--	1.2E-02	--	--	--	2.5E-03	--	--	--	2.9E-03	--	--	**--**	**2.9E-03**	**--**	**--**
Heptachlor [c]	0	5.2E-01	3.8E-03	7.9E-04	7.9E-04	6.1E-01	4.5E-03	1.5E-03	1.5E-03	1.3E-01	9.5E-04	7.9E-05	7.9E-05	1.5E-01	1.1E-03	1.5E-04	1.5E-04	**1.5E-01**	**1.1E-03**	**1.5E-04**	**1.5E-04**
Heptachlor Epoxide[c]	0	5.2E-01	3.8E-03	3.9E-04	3.9E-04	6.1E-01	4.5E-03	7.2E-04	7.2E-04	1.3E-01	9.5E-04	3.9E-05	3.9E-05	1.5E-01	1.1E-03	7.2E-05	7.2E-05	**1.5E-01**	**1.1E-03**	**7.2E-05**	**7.2E-05**
Hexachlorobenzene[c]	0	--	--	2.8E-03	2.9E-03	--	--	5.2E-03	5.4E-03	--	--	2.8E-04	2.9E-04	--	--	5.2E-04	5.4E-04	**--**	**--**	**5.2E-04**	**5.4E-04**
Hexachlorpbutadiene[c]	0	--	--	4.4E+00	1.8E+02	--	--	8.1E+00	3.3E+02	--	--	4.4E-01	1.8E+01	--	--	8.1E-01	3.3E+01	**--**	**--**	**8.1E-01**	**3.3E+01**
Hexachlorocyclohexane Alpha-BHC[c]	0	--	--	2.6E-02	4.9E-02	--	--	4.8E-02	9.1E-02	--	--	2.6E-03	4.9E-03	--	--	4.8E-03	9.1E-03	**--**	**--**	**4.8E-03**	**9.1E-03**
Hexachlorocyclohexane Beta-BHC[c]	0	--	--	9.1E-02	1.7E-01	--	--	1.7E-01	3.1E-01	--	--	9.1E-03	1.7E-02	--	--	1.7E-02	3.1E-02	**--**	**--**	**1.7E-02**	**3.1E-02**
Hexachlorocyclohexane Gamma-BHC[c] (Lindane)	0	9.5E-01	--	9.8E-01	1.8E+00	1.1E+00	--	1.8E+00	3.3E+00	2.4E-01	--	9.8E-02	1.8E-01	2.8E-01	--	1.8E-01	3.3E-01	**2.8E-01**	**--**	**1.8E-01**	**3.3E-01**
Hexachlorocyclopentadiene	0	--	--	4.0E+01	1.1E+03	--	--	5.1E+01	1.4E+03	--	--	4.0E+00	1.1E+02	--	--	5.1E+00	1.4E+02	**--**	**--**	**5.1E+00**	**1.4E+02**
Hexachloroethane[c]	0	--	--	1.4E+01	3.3E+01	--	--	2.6E+01	6.1E+01	--	--	1.4E+00	3.3E+00	--	--	2.6E+00	6.1E+00	**--**	**--**	**2.6E+00**	**6.1E+00**
Hydrogen Sulfide	0	--	2.0E+00	--	--	--	2.4E+00	--	--	--	5.0E-01	--	--	--	5.9E-01	--	--	**--**	**5.9E-01**	**--**	**--**
Indeno (1,2,3-cd) pyrene [c]	0	--	--	3.8E-02	1.8E-01	--	--	7.0E-02	3.3E-01	--	--	3.8E-03	1.8E-02	--	--	7.0E-03	3.3E-02	**--**	**--**	**7.0E-03**	**3.3E-02**
Iron	0	--	--	3.0E+02	--	--	--	3.9E+02	--	--	--	3.0E+01	--	--	--	3.9E+01	--	**--**	**--**	**3.9E+01**	**--**
Isophorone[c]	0	--	--	3.5E+02	9.6E+03	--	--	6.5E+02	1.8E+04	--	--	3.5E+01	9.6E+02	--	--	6.5E+01	1.8E+03	**--**	**--**	**6.5E+01**	**1.8E+03**
Kepone	0	--	0.0E+00	--	--	--	0.0E+00	--	--	--	0.0E+00	--	--	--	0.0E+00	--	--	**--**	**0.0E+00**	**--**	**--**
Lead	0	1.5E+02	1.6E+01	1.5E+01	--	1.7E+02	1.9E+01	1.9E+01	--	3.6E+01	4.1E+00	1.5E+00	--	4.2E+01	4.8E+00	1.9E+00	--	**4.2E+01**	**4.8E+00**	**1.9E+00**	**--**
Malathion	0	--	1.0E-01	--	--	--	1.2E-01	--	--	--	2.5E-02	--	--	--	2.9E-02	--	--	**--**	**2.9E-02**	**--**	**--**
Manganese	0	--	--	5.0E+01	--	--	--	6.4E+01	--	--	--	5.0E+00	--	--	--	6.4E+00	--	**--**	**--**	**6.4E+00**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	1.6E+00	9.1E-01	- -	- -	3.5E-01	1.9E-01	- -	--	4.1E-01	2.3E-01	- -	--	**4.1E-01**	**2.3E-01**	**- -**	**- -**
Methyl Bromide	0	--	--	4.7E+01	1.5E+03	--	--	6.0E+01	1.9E+03	--	--	4.7E+00	1.5E+02	--	--	6.0E+00	1.9E+02	**--**	**--**	**6.0E+00**	**1.9E+02**
Methylene Chloride [c]	0	--	--	4.6E+01	5.9E+03	--	--	8.5E+01	1.1E+04	--	--	4.6E+00	5.9E+02	--	--	8.5E+00	1.1E+03	**--**	**--**	**8.5E+00**	**1.1E+03**
Methoxychlor	0	--	3.0E-02	1.0E+02	--	--	3.5E-02	1.3E+02	--	--	7.5E-03	1.0E+01	--	--	8.8E-03	1.3E+01	--	**--**	**8.8E-03**	**1.3E+01**	**--**
Mirex	0	--	0.0E+00	--	--	--	0.0E+00	--	--	--	0.0E+00	--	--	--	0.0E+00	--	--	**--**	**0.0E+00**	**--**	**--**
Nickel	0	2.1E+02	2.3E+01	6.1E+02	4.6E+03	2.4E+02	2.7E+01	7.8E+02	5.9E+03	5.2E+01	5.8E+00	6.1E+01	4.6E+02	6.1E+01	6.8E+00	7.8E+01	5.9E+02	**6.1E+01**	**6.8E+00**	**7.8E+01**	**5.9E+02**
Nitrate (as N)	0	--	--	1.0E+04	--	--	--	1.3E+04	--	--	--	1.0E+03	--	--	--	1.3E+03	--	**--**	**--**	**1.3E+03**	**--**
Nitrobenzene	0	--	--	1.7E+01	6.9E+02	--	--	2.2E+01	8.9E+02	--	--	1.7E+00	6.9E+01	--	--	2.2E+00	8.9E+01	**--**	**--**	**2.2E+00**	**8.9E+01**
N-Nitrosodimethylamine[c]	0	--	--	6.9E-03	3.0E+01	--	--	1.3E-02	5.6E+01	--	--	6.9E-04	3.0E+00	--	--	1.3E-03	5.6E+00	**--**	**--**	**1.3E-03**	**5.6E+00**
N-Nitrosodiphenylamine[c]	0	--	--	3.3E+01	6.0E+01	--	--	6.1E+01	1.1E+02	--	--	3.3E+00	6.0E+00	--	--	6.1E+00	1.1E+01	**--**	**--**	**6.1E+00**	**1.1E+01**
N-Nitrosodi-n-propylamine[c]	0	--	--	5.0E-02	5.1E+00	--	--	9.3E-02	9.4E+00	--	--	5.0E-03	5.1E-01	--	--	9.3E-03	9.4E-01	**--**	**--**	**9.3E-03**	**9.4E-01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.3E+01	7.8E+00	--	--	7.0E+00	1.7E+00	--	--	8.2E+00	1.9E+00	--	--	**8.2E+00**	**1.9E+00**	**--**	**--**
Parathion	0	6.5E-02	1.3E-02	--	--	7.6E-02	1.5E-02	--	--	1.6E-02	3.3E-03	--	--	1.9E-02	3.8E-03	--	--	**1.9E-02**	**3.8E-03**	**--**	**--**
PCB Total[c]	0	--	1.4E-02	6.4E-04	6.4E-04	--	1.6E-02	1.2E-03	1.2E-03	--	3.5E-03	6.4E-05	6.4E-05	--	4.1E-03	1.2E-04	1.2E-04	**--**	**4.1E-03**	**1.2E-04**	**1.2E-04**
Pentachlorophenol [c]	0	1.5E+01	1.2E+01	2.7E+00	3.0E+01	1.8E+01	1.4E+01	5.0E+00	5.6E+01	3.8E+00	2.9E+00	2.7E-01	3.0E+00	4.4E+00	3.4E+00	5.0E-01	5.6E+00	**4.4E+00**	**3.4E+00**	**5.0E-01**	**5.6E+00**
Phenol	0	--	--	1.0E+04	8.6E+05	--	--	1.3E+04	1.1E+06	--	--	1.0E+03	8.6E+04	--	--	1.3E+03	1.1E+05	**--**	**--**	**1.3E+03**	**1.1E+05**
Pyrene	0	--	--	8.3E+02	4.0E+03	--	--	1.1E+03	5.1E+03	--	--	8.3E+01	4.0E+02	--	--	1.1E+02	5.1E+02	**--**	**--**	**1.1E+02**	**5.1E+02**
Radionuclides	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**	**--**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	1.5E+01	--	--	--	1.9E+01	--	--	--	1.5E+00	--	--	--	1.9E+00	--	**--**	**--**	**1.9E+00**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	4.0E+00	--	--	--	5.1E+00	--	--	--	4.0E-01	--	--	--	5.1E-01	--	**--**	**--**	**5.1E-01**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	5.0E+00	--	--	--	6.4E+00	--	--	--	5.0E-01	--	--	--	6.4E-01	--	**--**	**--**	**6.4E-01**	**--**
Uranium (ug/l)	0	--	--	3.0E+01	--	--	--	3.9E+01	--	--	--	3.0E+00	--	--	--	3.9E+00	--	**--**	**--**	**3.9E+00**	**--**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	1.7E+02	4.2E+03	2.3E+01	5.9E+00	2.2E+02	5.4E+03	5.0E+00	1.3E+00	1.7E+01	4.2E+02	5.8E+00	1.5E+00	2.2E+01	5.4E+02	**5.8E+00**	**1.5E+00**	**2.2E+01**	**5.4E+02**
Silver	0	4.5E+00	--	--	--	5.3E+00	--	--	--	1.1E+00	--	--	--	1.3E+00	--	--	--	**1.3E+00**	**--**	**--**	**--**
Sulfate	0	--	--	2.5E+05	--	--	--	3.2E+05	--	--	--	2.5E+04	--	--	--	3.2E+04	--	**--**	**--**	**3.2E+04**	**--**
1,1,2,2-Tetrachloroethane[c]	0	--	--	1.7E+00	4.0E+01	--	--	3.1E+00	7.4E+01	--	--	1.7E-01	4.0E+00	--	--	3.1E-01	7.4E+00	**--**	**--**	**3.1E-01**	**7.4E+00**
Tetrachloroethylene[c]	0	--	--	6.9E+00	3.3E+01	--	--	1.3E+01	6.1E+01	--	--	6.9E-01	3.3E+00	--	--	1.3E+00	6.1E+00	**--**	**--**	**1.3E+00**	**6.1E+00**
Thallium	0	--	--	2.4E-01	4.7E-01	--	--	3.1E-01	6.0E-01	--	--	2.4E-02	4.7E-02	--	--	3.1E-02	6.0E-02	**--**	**--**	**3.1E-02**	**6.0E-02**

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Toluene	0	--	--	5.1E+02	6.0E+03	--	--	6.6E+02	7.7E+03	--	--	5.1E+01	6.0E+02	--	--	6.6E+01	7.7E+02	--	--	**6.6E+01**	**7.7E+02**
Total dissolved solids	0	--	--	5.0E+05	--	--	--	6.4E+05	--	--	--	5.0E+04	--	--	--	6.4E+04	--	--	--	**6.4E+04**	--
Toxaphene [c]	0	7.3E-01	2.0E-04	2.8E-03	2.8E-03	8.5E-01	2.4E-04	5.2E-03	5.2E-03	1.8E-01	5.0E-05	2.8E-04	2.8E-04	2.1E-01	5.9E-05	5.2E-04	5.2E-04	**2.1E-01**	**5.9E-05**	**5.2E-04**	**5.2E-04**
Tributyltin	0	4.6E-01	7.2E-02	--	--	5.4E-01	8.5E-02	--	--	1.2E-01	1.8E-02	--	--	1.3E-01	2.1E-02	--	--	**1.3E-01**	**2.1E-02**	--	--
1,2,4-Trichlorobenzene	0	--	--	3.5E+01	7.0E+01	--	--	4.5E+01	9.0E+01	--	--	3.5E+00	7.0E+00	--	--	4.5E+00	9.0E+00	--	--	**4.5E+00**	**9.0E+00**
1,1,2-Trichloroethane [c]	0	--	--	5.9E+00	1.6E+02	--	--	1.1E+01	3.0E+02	--	--	5.9E-01	1.6E+01	--	--	1.1E+00	3.0E+01	--	--	**1.1E+00**	**3.0E+01**
Trichloroethylene [c]	0	--	--	2.5E+01	3.0E+02	--	--	4.6E+01	5.6E+02	--	--	2.5E+00	3.0E+01	--	--	4.6E+00	5.6E+01	--	--	**4.6E+00**	**5.6E+01**
2,4,6-Trichlorophenol [c]	0	--	--	1.4E+01	2.4E+01	--	--	2.6E+01	4.4E+01	--	--	1.4E+00	2.4E+00	--	--	2.6E+00	4.4E+00	--	--	**2.6E+00**	**4.4E+00**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	5.0E+01	--	--	--	6.4E+01	--	--	--	5.0E+00	--	--	--	6.4E+00	--	--	--	**6.4E+00**	--
Vinyl Chloride [c]	0	--	--	2.5E-01	2.4E+01	--	--	4.6E-01	4.4E+01	--	--	2.5E-02	2.4E+00	--	--	4.6E-02	4.4E+00	--	--	**4.6E-02**	**4.4E+00**
Zinc	0	1.3E+02	1.3E+02	7.4E+03	2.6E+04	1.6E+02	1.6E+02	9.5E+03	3.3E+04	3.4E+01	3.4E+01	7.4E+02	2.6E+03	3.9E+01	4.0E+01	9.5E+02	3.3E+03	**3.9E+01**	**4.0E+01**	**9.5E+02**	**3.3E+03**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information. Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	7.2E-01
Arsenic	1.3E+00
Barium	2.6E+02
Cadmium	2.3E-01
Chromium III	1.5E+01
Chromium VI	1.9E+00
Copper	1.8E+00
Iron	3.9E+01
Lead	1.9E+00
Manganese	6.4E+00
Mercury	1.4E-01
Nickel	4.1E+00
Selenium	8.8E-01
Silver	5.3E-01
Zinc	1.6E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

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Facility = Moneta Regional WWTP
Chemical = ammonia (high flow)
Chronic averaging period = 30
WLAa = 1.23
WLAc = 0.333
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 0.671884141107632
Average Weekly limit = 0.671884141107632
Average Monthly LImit = 0.671884141107632

The data are:

9

4/28/2015 10:27:39 AM

Facility = Moneta Regional WWTP
Chemical = ammonia (annual/low flow)
Chronic averaging period = 30
WLAa = 1.08
WLAc = 0.193
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 0.389410328029348
Average Weekly limit = 0.389410328029348
Average Monthly LImit = 0.389410328029348

The data are:

9

4/28/2015 4:42:03 PM

Facility = Moneta Regional WWTP
Chemical = copper
Chronic averaging period = 4
WLAa = 4.6
WLAc = 3
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 18.0333
Variance = 117.072
C.V. = 0.6
97th percentile daily values = 43.8826
97th percentile 4 day average = 30.0036
97th percentile 30 day average= 21.7491
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 4.38772435215969
Average Weekly limit = 4.3877243521597
Average Monthly LImit = 4.3877243521597

The data are:

18.1
22
14

4/28/2015 4:43:31 PM

Facility = Moneta Regional WWTP
Chemical = Nickel
Chronic averaging period = 4
WLAa = 61
WLAc = 6.8
Q.L. = 3
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 4.46507
Variance = 7.17726
C.V. = 0.6
97th percentile daily values = 10.8653
97th percentile 4 day average = 7.42893
97th percentile 30 day average= 5.38511
< Q.L. = 1
Model used = BPJ Assumptions, Type 1 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 9.94550853156198
Average Weekly limit = 9.94550853156198
Average Monthly LImit = 9.94550853156198

The data are:

5.19
7.2
0

4/28/2015 4:45:04 PM

Facility = Moneta Regional WWTP
Chemical = Zinc
Chronic averaging period = 4
WLAa = 39
WLAc = 40
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = 61.8875
Variance = 1378.82
C.V. = 0.6
97th percentile daily values = 150.598
97th percentile 4 day average = 102.967
97th percentile 30 day average= 74.6396
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 39
Average Weekly limit = 39
Average Monthly LImit = 39

The data are:

34.1
62
63
74
65
73
76
48

SITE SPECIFIC METAL LIMIT DEVELOPMENT: PARTIAL TRANSLATOR STUDY FOR ZINC

SHEALY CONSULTING, LLC

BEDFORD REGIONAL WATER AUTHORITY, VIRGINIA: MONETA REGIONAL WASTE WATER TREATMENT PLANT

October 2013

This report contains the results of four sampling events conducted in an effort to derive a site-specific zinc limit for the Moneta Regional Wastewater Treatment Plant in Bedford County, Virginia. The results of the four attempts indicate that this procedure is not be a feasible method for raising the zinc limit at the Moneta Regional WWTP.

SECTION 1: Introduction

The Bedford Regional Water Authority owns and operates the Moneta Wastewater Treatment Plant off of White House Road in Moneta, Virginia. The facility operates under NPDES permit #VA0091669, and discharges into Hunting Creek in the Roanoke River basin. The discharge permit currently includes a limit for zinc of 34 µg/L, monthly and weekly average. Concerns regarding compliance with this limit prompted the Bedford Regional Water Authority to consider site-specific methods for zinc limit development.

The Water Quality Criteria used to develop metals limits apply to the entire United States, and the US Environmental Protection Agency (USEPA) understands that they are overly protective at many sites. The EPA has developed and published methods that allow the re-evaluation of these criteria on a site-specific basis, which will result in increased final limits in most cases. There are several published options approved by the US EPA for use in developing site-specific metal limits. The first option is the Water-Effect Ratio, a procedure that works well with many metals, but not for zinc. The second option is the Recalculation Procedure, which can work well for zinc in many cases, but which is currently not approved for use by the Virginia Department of Environmental Quality (VADEQ). A third option is the Metal Translator procedure.

The metal translator estimates the fraction of the total discharged metal that will subsequently be dissolved in the receiving stream. In order to directly develop a site-specific conversion factor, or translator, dissolved and total metal concentrations are measured in water representing completely mixed receiving stream water and effluent during low-flow conditions. The translator is the ratio of dissolved to total metal concentration, and is calculated as the central tendency of ratio values developed for numerous sampling events.

This report will provide data from four sampling events collected at the Moneta WWTP in an attempt to develop a useful metal translator for zinc. The results provided in this report may be used to determine the feasibility of completing the ten sampling events required for the development of a valid metal translator.

Section 2: Study Objective

The objective of this study was to derive a site-specific metal translator for zinc for the Moneta Regional WWTP outfall 001 which discharges into Hunting Creek. Samples of Moneta Regional WWTP final effluent and upstream receiving water were collected and combined to represent completely mixed downstream water. The receiving stream 1Q10 of 0.082 MGD and the design flow for the WWTP of 0.5 MGD were used to calculate the ratio of effluent to receiving stream water in the mixture. The mixed samples were analyzed for total and dissolved zinc, hardness, and total suspended solids. The translator was calculated as the geometric mean of the ratios of dissolved to total zinc measurements for all sample pairs. Sample collection and analysis was conducted by the Hampton Roads Sanitation District (VELAP#460011). Data analysis and the calculation of the translator was conducted by Shealy Consulting, LLC (VELAP # 460190).

Four sampling events were completed, and the translator calculated. The results of the four sampling events may be used to determine the feasibility of completing the full translator study for the Moneta Regional WWTP.

Section 3: Methods

2.1 Sample Conditions

In order to collect samples for the development of a translator, the following conditions were met:

- Flows approached permit design-flow conditions. This was achieved by documenting plant flow and weather conditions. Sampling was not conducted if a significant rain event (0.25 inches or more) occurred within 3 days prior to the sampling date.
- The WWTP was operating within permitted specifications. With each sampling event the following final effluent parameters were analyzed: BOD, TSS, TKN, and ammonia-N. If these analyses were in-range, the WWTP was operating within permitted specifications. Table 1 provides the permitted limits for the parameters measured.

Table 1: Town of Moneta WWTP Permit Limits

Measurement	Permitted Monthly Average	Permitted Weekly Average
WWTP Flow (Design Flow)	0.5 MGD	0.5 MGD
BOD (mg/L)	7	10
Ammonia-Nitrogen (mg/L)	1.1 (Jan-May) 0.6 (June – Dec)	1.1 (Jan-May) 0.6 (June – Dec)
TKN (mg/L)	5	7.5
TSS (mg/L)	30	45

2.2 Sample Locations

Samples were collected from two locations. Final effluent was collected in the post-treatment aeration flume just after Ultraviolet disinfection. Receiving stream water was collected approximately 95 feet upstream from the discharge pipe. The designated collection area was just before a small island which divided the stream into two branches. The two branches converge just after the discharge pipe.

2.3 Sampling Procedures

The Hampton Roads Sanitation District conducted all sample collections, mixing, and analysis for the zinc translator study. A specially equipped mobile laboratory was transported to the site for the duration of the project. This mobile laboratory provided a 'clean' workspace for constructing the simulated downstream mix (SIMSTREAM) and for filtering samples in preparation for dissolved zinc analysis.

Final effluent was collected as an 8-hour composite. "Clean" hands / "dirty" hands procedures were used in handling samples. Flow, temperature, and pH were documented for the final effluent. Final effluent was taken from the compositor to the mobile laboratory and aliquots were appropriately preserved for the following analyses: BOD_5, TSS, TKN, total zinc and ammonia. An aliquot was filtered through a 0.45µm filter capsule for dissolved zinc analysis within 15 minutes of sample collection. An aliquot was retained in the mobile laboratory for use in creating the SIMSTREAM sample.

Receiving stream samples were collected from a station located upstream from the discharge pipe (see Section 2.2 for details). "Clean" hands / "dirty" hands procedures were used in handling samples. Flow, temperature, and pH were documented for the receiving stream, and a visual inspection of the receiving stream was used to verify that visible particulate matter was present. Receiving stream water was pumped directly through a 0.45µm capsule filter for dissolved zinc analysis. Receiving stream water was also collected for the analysis of total zinc, TSS, and hardness. An aliquot of receiving stream water was taken to the mobile laboratory for use in creating the SIMSTREAM sample.

The SIMSTREAM sample was created by combining final effluent and receiving stream water in proportions that reflect design-flow conditions. The 1Q10 for the facility is 0.082 MGD and the design flow of the WWTP is 0.5MGD, so the SIMSTREAM was comprised of 85.9% final effluent and 14.1% receiving stream water. The SIMSTREAM was prepared using acid-washed cylinders and glassware. "Clean" hands / "dirty" hands procedures were also used in handling samples. The pH and temperature of the SIMSTREAM was documented. Filtration of the SIMSTREAM through a 0.45µm capsule filter occurred within 15 minutes of sample preparation. Unfiltered SIMSTREAM was collected and appropriately preserved for the analysis of total zinc, TSS, and hardness.

2.4 Quality Control Procedures

'Clean' hands / 'Dirty' hands procedures were used during sample collection and SIMSTREAM mixing. Field blanks were collected and analyzed for total zinc prior to the collection of final effluent and receiving stream. Field blanks were collected and analyzed for dissolved zinc prior to the filtration of receiving stream and SIMSTREAM.

Section 3: Results and Calculation of the Zinc Translator

3.1 Monitoring Results

The sampling conditions are summarized below for each of the four sampling events. Although BOD was not measured for the June 25, 2013, sampling event, all other results indicate that the WWTP was operating normally. No visible particulate matter was observed in upstream water samples for all four of the sampling events. Table 2 provides the monitoring data collected for the sampling events. Final analytical reports are provided in the Appendix.

Table 2: Weather and Operational Conditions for the Zinc Translator Sampling Events.

Sample Date	Rain Total for Previous 3 Days (in)	WWTP Flow (MGD)	BOD_5 (mg/L)	Ammonia-N (mg/L)	TKN (mg/L)	TSS (mg/L)
May 29, 2013	0.04	0.037	<2	<0.20	2.41	3.9
June 25, 2013	0.0	0.039	NR	<0.20	1.86	2.7
July 30, 2013	0.22	0.042	2	<0.20	1.70	<1.0
August 27, 2013	0.0	0.097	<2	<0.20	1.10	<1.0

NR = not reported due to low sample volume

3.2 Quality Control Results

Table 3 provides the results of all field blank analyses. Only one hit was reported; the field blank for the FNE (final effluent) collected during the July 30, 2013, sampling event was 4.7μg/L. Analytical reports are available in the Appendix.

Table 3: Field Blank Analyses for the Moneta Regional WWTP Zinc Translator Study

Sample Date	Final Effluent Field Blank Total Zinc (µg/L)	Receiving Stream Field Blank Total Zinc (µg/L)	Receiving Stream Field Blank Dissolved Zinc (µg/L)	SIMSTREAM Field Blank Dissolved Zinc (µg/L)
May 29, 2013	<1.0	<1.0	<1.0	<1.0
June 25, 2013	<1.0	<1.0	<1.0	<1.0
July 30, 2013	4.7	<1.0	<1.0	<1.0
August 27, 2013	<1.0	<1.0	<1.0	>1.0

3.3 Calculation of the Zinc Translator

Table 4 provides the total and dissolved zinc results for the water samples. All data for the SIMSTREAM were above the reporting limit of 1.0 µg/L, therefore, all data sets were acceptable for use in the calculation of the translator.

Table 4: Total and Dissolved Zinc Results for the Moneta Regional WWTP Zinc Translator Study

Sample Date	Receiving Stream Total Zinc (µg/L)	Receiving Stream Dissolved Zinc (µg/L)	SIMSTREAM Total Zinc (µg/L)	SIMSTREAM Dissolved Zinc (µg/L)
May 29, 2013	<1.0	<1.0	73.5	65.7
June 25, 2013	<1.0	<1.0	102	92.7
July 30, 2013	1.6	<1.0	30.6	27.4
August 27, 2013	<1.0	<1.0	39.4	39.5

The translator was calculated for each SIMSTREAM sample as the ratio of dissolved zinc to total zinc. Table 5 provides the zinc results and calculated translator.

Table 5: Zinc Translators Calculated for the Moneta Regional WWTP

Sample Date	Total Zinc (µg/L)	Dissolved Zinc (µg/L)	Translator
May 29, 2013	73.5	65.7	0.89
June 25, 2013	102	92.7	0.91
July 30, 2013	30.6	27.4	0.90
August 27, 2013	39.4	39.5	1.0

The geometric mean of the translator values is **0.92**. This is the final translator based on the results of the four sampling events. This indicates that the total zinc is comprised of 92% dissolved zinc. The final zinc limit would be raised about 8%. The limit of 34 µg/L would become approximately 37µg/L.

Section 4: Evaluation of the Procedure

Prior to the initiation of the zinc translator study for the Moneta Regional WWTP in May 2013, a review of the total and dissolved zinc values of 5 final effluent samples was conducted to determine the potential result that could be obtained. These data were collected on final effluent samples and provided to Shealy Consulting, LLC, by personnel of the Moneta Regional WWTP, and are summarized in Table 5.

Table 5: Zinc Translators Calculated for Preliminary Data from the Moneta Regional WWTP

Sample Date	Total Zinc (µg/L)	Dissolved Zinc (µg/L)	Translator
January 3, 2013	76	62	0.82
January 18, 2013	75	63	0.84
January 31, 2013	105	74	0.70
February 14, 2013	83	65	0.78
February 28, 2013	91	73	0.80

For this preliminary data set, the calculated final zinc translator is 0.79. This translator indicates that total zinc in the effluent is comprised of about 79% dissolved zinc. The translator derived from this data set would have raised the Moneta Regional WWTP final zinc limit about 21%. A 21% increase in the final zinc limit may have justified the completion of the Zinc Translator procedure for the Moneta Regional WWTP. The decision was made to initiate the study by collecting samples using the detailed procedures required by VADEQ.

The study was initiated in May 2013 using the required translator methods. These requirements include the dilution of effluent to 85.9% with receiving stream water prior to the analysis of total and dissolved zinc. After four sampling events were completed and analyzed, the actual resulting translator was less than 10%. The decrease in the translator from the preliminary data set to the actual translator data set may be due to the dilution requirement or other factors in the sampling procedure. Regardless, it appears that the Zinc Translator procedure is not a feasible method for providing an increased zinc limit in the Moneta Regional WWTP permit.

Section 5: References

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SHEALY CONSULTING, LLC

WATER-EFFECT RATIO FOR COPPER: STREAMLINED METHOD SUMMARY REPORT

BEDFORD REGIONAL WATER AUTHORITY, VIRGINIA: MONETA REGIONAL WASTE WATER TREATMENT PLANT

OCTOBER 2013

This report summarizes the results of a copper Water-Effect Ratio study performed for the Bedford Regional Water Authority, Moneta Regional WWTP. The simulated stream samples used in this study consisted of 85.9% final effluent and 14.1% upstream water. A common hardness of 50 mg/L was used to normalize EC50 values prior to calculating WER values.

Streamlined WER for Copper Summary Report

1. General information

NPDES # VA0091669
Plant name: Moneta Regional WWTP
Endpoint used in study (LC50, EC50, etc.): EC50
Stream 1Q10 flow = 0.082 MGD
Design flow = 0.50 MGD
Species used: *Ceriodaphnia dubia*
Form of copper used: $CuSO_4 * 5 H_2O$

Final WER: 4.096

Current limits on permit:

Measurement	Monthly Average	Weekly Average
BOD (mg/L)	7	10
Ammonia-Nitrogen (mg/L) January - May	1.1	1.1
Ammonia-Nitrogen (mg/L) June – December	0.6	0.6
TKN (mg/L)	5	7.5
TSS (mg/L)	30	45

2. Chemical data (minimum 2 events, at least 4 weeks between each sampling)

Physico-chemical data for sampling date: May 29, 2013.

Parameter	LABWATER	Final Effluent	Receiving Stream	SIMSTREAM
BOD		<2 mg/L*		
Ammonia-N		<0.2 mg/L*		
TKN		2.41 mg/L*		
TOC	<1.0 mg/L	9.6 mg/L	2.0 mg/L	8.6 mg/L
DOC	1.5 mg/L	9.1 mg/L	3.9 mg/L	8.1 mg/L
Specific Conductance	330 μmhos/cm	910 μmhos/cm	128 μmhos/cm	772 μmhos/cm
TSS	<1.0 mg/L	3.9 mg/L*	3.3 mg/L*	3.0 mg/L
Alkalinity	58 mg/L	126 mg/L	47 mg/L	130 mg/L
Hardness	86 mg/L	134 mg/L	57 mg/L	120 mg/L
Total Copper	<1.0 μg/L	25 μg/L	1.3 μg/L	22 μg/L
Dissolved Copper	<1.0 μg/L	22 μg/L	<1.0 μg/L	19 μg/L

* Analyzed at HRSD, Central Environmental Laboratory, Virginia Beach, Virginia

Moneta Regional WWTP Flow during sample collection = 0.037 MGD
Hunting Creek Flow reported during sample collection = 0.55 cfs.

Physico-chemical data for sampling date: August 27, 2013.

Parameter	LABWATER	Final Effluent	Receiving Stream	SIMSTREAM
BOD		< 2 mg/L*		
Ammonia-N		< 0.20 mg/L*		
TKN		1.10 mg/L*		
TOC	<1.0 mg/L	7.0 mg/L	1.8 mg/L	6.4 mg/L
DOC	1.3 mg/L	7.0 mg/L	2.2 mg/L	6.2 mg/L
Specific Conductance	327 μmhos/cm	640 μmhos/cm	132 μmhos/cm	571 μmhos/cm
TSS	<1.0 mg/L	< 1.0 mg/L*	1.7 mg/L*	1.3 mg/L
Alkalinity	58 mg/L	118 mg/L	52 mg/L	112 mg/L
Hardness	89 mg/L	111 mg/L	53 mg/L	96 mg/L
Total Copper	<1.0 μg/L	15 μg/L	1.1 μg/L	13 μg/L
Dissolved Copper	<1.0 μg/L	14 μg/L	<1.0 μg/L	11 μg/L

* Analyzed at HRSD, Central Environmental Laboratory, Virginia Beach, Virginia

Moneta Regional WWTP Flow during sample collection = 0.097 MGD
Hunting Creek Flow reported during sample collection = 0.49 cfs.

3. Test Results

Test results for sampling date: May 29, 2013.

	EC50 (µg/L Copper)		EC50 (µg/L Copper) Hardness normalized to 50 mg/L as $CaCO_3$		WER* (EC50/SMAV)	
Test	total	dissolved	total	dissolved	total	dissolved
LABWATER	9.061	8.514	5.436	5.108		
SIMSTREAM	122.8	107.7	53.82	47.20	**4.309**	**4.101**

*-simulated stream water LC50/greater of lab water LC50 or SMAV
Total copper SMAV at 50 mg/L = 12.49
Dissolved copper SMAV at 50 mg/L= 11.51

Test results for sampling date: August 27, 2013.

	EC50 (µg/L Copper)		EC50 (µg/L Copper) Hardness normalized to 50 mg/L as $CaCO_3$		WER (EC50/SMAV)	
Test	total	dissolved	total	dissolved	total	dissolved
LABWATER	10.39	9.737	6.035	5.656		
SIMSTREAM	89.89	82.71	48.62	44.73	**3.893**	**3.886**

*-simulated stream water LC50/greater of lab water LC50 or SMAV
Total copper SMAV at 50 mg/L = 12.49
Dissolved copper SMAV at 50 mg/L= 11.51

4. FWER calculation

List of WER's calculated at a hardness of 50 mg/L.

Study Date	Total Copper WER	Dissolved Copper WER
May 30, 2013	4.309	4.101
August 28, 2013	3.893	3.886

Final WER = $\left(\prod_{i1}^{n} WER_i\right)^{1/n}$ Final WER is the geometric mean of all sample WERs, or the *n*th root of the product of the *n* sample WERs.

FWER= **4.096.**

TEXT REPORT

SHEALY CONSULTING, LLC

WATER-EFFECT RATIO FOR COPPER: STREAMLINED METHOD

BEDFORD REGIONAL WATER AUTHORITY, VIRGINIA: MONETA REGIONAL WASTE WATER TREATMENT PLANT

October 2013

SECTION 1: Introduction

The Bedford Regional Water Authority owns and operates the Moneta Wastewater Treatment Plant off of White House Road in Moneta, Virginia. The facility operates under NPDES permit #VA0091669, and discharges into Hunting Creek in the Roanoke River basin. The discharge permit does not currently include a limit for copper, but concerns regarding compliance with future copper limits prompted the Bedford Regional Water Authority to consider site-specific methods for copper limit development. At the request of the Bedford Regional Water Authority, a copper water-effect ratio (WER) study was conducted for the Moneta WWTP by Shealy Consulting, LLC. Because the metal of concern was copper, the Streamlined Procedure for copper was implemented.

The studies used to develop the copper WER for the Moneta WWTP adhered to EPA 823-B-94-001, *Interim Guidance on Determination and Use of Water-Effect Ratios for `Metals*, and the copper Streamlined Procedure provided in EPA 822-R-01-005, *Streamlined Water-Effect Ratio Procedure for Discharges of Copper*. For detailed acute toxicity testing guidance, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition, EPA 821-R-02-012, was used. The WER was determined using *Ceriodaphnia dubia*, a freshwater invertebrate in the family Cladocera.

The first study of the copper WER Streamlined Procedure was conducted May 30, 2013, using effluent and receiving stream samples collected May 29, 2013. The WER's for *C. dubia* were 4.309 for total copper, and 4.101 for dissolved copper.

The second copper WER study was conducted August 28, 2013, using effluent and receiving stream samples collected August 27, 2013. The resulting WER values were 3.893 for total copper, and 3.886 for dissolved copper.

The final water-effect ratio (FWER) is determined as the geometric mean of the two total WER values. The FWER for copper generated for the Moneta WWTP is 4.096.

Section 2: Study #1, Water-Effect Ratio Study Conducted May 30, 2013

2.1 Sampling Information

On May 29, 2013, a composite sampler was set-up by personnel of the Hampton Roads Sanitation District (HRSD), to collect final effluent at the Moneta WWTP. Teflon tubing was used in the compositors. To collect a field blank, de-ionized water was pumped through the compositing unit and preserved with nitric acid for total copper analysis. The compositor began sampling at 0600 on May 29, 2013, and completed the 8-hour collection period at 1345 on May 29, 2013. The final effluent was poured into 1 gallon containers with all air space removed.

Samples were packed on ice for transport to Shealy Consulting, LLC, in Lexington, South Carolina. A copy of the Chain-of-Custody form which accompanied the samples is available in Appendix A. The samples were received at Shealy Consulting, LLC, May 30, 2013, at 0908. A receipt temperature of 2.3°C was documented. The receiving stream sample was assigned the unique ID#C0844, and the effluent sample was assigned the unique ID# C0845. The samples were stored in a refrigeration unit set between 0 and 4°C. No air space was observed in the effluent sample containers prior to use in testing.

Weather conditions for 14 days prior to sample collection were obtained from monitoring reports for a nearby National Weather Service station KVAMONET1: Smith Mountain Lake @Hales Ford Bridge, in Moneta, Virginia. A summary of the weather conditions is provided in Appendix A.

2.2 Sampling Conditions

Moneta WWTP personnel reported a plant effluent flow of 0.037 MGD for May 29, 2013. The BOD measured in the effluent was <2 mg/L, ammonia-N was <0.2 mg/L, TKN was 2.41 mg/L, and TSS was 3.9 mg/L. All of these parameters were less than the permitted discharge limits, indicating that the treatment plant was operating normally during the sampling event (see Table 1).

The stream flow of the Roanoke River near the discharge area (USGS#02055000) was reported to be 358 cfs. The flow of the Roanoke River was not significantly above average flow during sampling, which indicates that the rivers in the vicinity, including Hunting Creek, were flowing normally and were not impacted by weather events. No visible particulate matter was observed in Hunting Creek during sampling.

Table 1: Town of Moneta WWTP Permit Limits

Measurement	**Effluent Collected May 29, 2013**	**Permitted Monthly Average**	**Permitted Weekly Average**
WWTP Flow	0.037 MGD	--	--
BOD (mg/L)	< 2	7	10
Ammonia-Nitrogen (mg/L)	< 0.2	1.1 (Jan-May)	1.1 (Jan-May)
TKN (mg/L)	2.41	5	7.5
TSS (mg/L)	3.9	30	45

2.3 Copper Source for Study #1

The copper source for Study #1 was cupric sulfate pentahydrate ($CuSO_4*5H_2O$) obtained from Fisher Scientific. The container of cupric sulfate was designated as SHEALY # T12-119. A primary copper stock was prepared on May 30, 2013, by adding 1.00002 g cupric sulfate pentahydrate to 1 liter de-ionized water in a volumetric flask. The stock was designated as #268.

2.4 LABWATER Test Dilutions for Study #1

Laboratory dilution water was prepared on May 23, 2013, and was designated EPA-236. To prepare the dilution water, Town of Lexington drinking water was treated with mixed-bed de-ionizers, UV filtration, an ultra-filtration polishing unit, and a bacterial filter to produce Type I de-ionized water. Dilution water was prepared by adding reagents to the de-ionized water according to the procedure for obtaining moderately hard synthetic dilution water found in Section 7 of EPA 82-R-02-012, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*. This procedure produces water with hardness in the range of 80-100 mg/L as $CaCO_3$.

A LABWATER sub-stock of cupric sulfate was prepared on May 30, 2013, by diluting 2 ml of the primary copper stock to 500 ml with EPA-236. This provided a sub-stock with a nominal copper concentration of 1 mg/L. The test dilutions were prepared by combining the LABWATER sub-stock with un-spiked EPA-236 to obtain the following nominal copper concentrations: 2.5, 3.9, 6.0, 9.1, 14, and 21 µg/L. Acid washed Class 'A' pipettes and cylinders were used to prepare sub-stocks and dilutions.

Table 2: Preparation of LABWATER test dilutions for the Moneta WWTP WER study conducted May 30-June 1, 2013.

Treatment (% LABWATER Sub-stock)	Nominal Copper Concentration (µg/L)	LABWATER Sub-stock Used (ml)	Dilution
Lab. Control	0	0	To 400 ml with EPA-236
0.25	2.5	1.0	To 400 ml with EPA-236
0.39	3.9	1.6	To 400 ml with EPA-236
0.60	6.0	2.4	To 400 ml with EPA-236
0.91	9.1	3.6	To 400 ml with EPA-236
1.4	14	5.6	To 400 ml with EPA-236
2.1	21	8.4	To 400 ml with EPA-236

All dilutions were prepared by 1040 on May 30, 2013. A 125 ml aliquot of each dilution was preserved with nitric acid for total copper analysis. A separate 125 ml aliquot of each dilution was filtered at 0.45 µm and preserved with nitric acid for dissolved copper analysis. The remaining solution was used for toxicity testing.

2.5 SIMSTREAM Test Dilutions for Study #1

The Streamlined Procedure dictates that Simulated Stream water (SIMSTREAM) must be constructed by combining Moneta WWTP final effluent and upstream receiving stream water at the design low-flow conditions (Instream Waste Concentration, or IWC). The 1Q10 of the receiving stream is 0.082 MGD, and the design flow of the Moneta WWTP is 0.50 MGD, so the SIMSTREAM water consisted of 85.9% effluent. The hardness value of 50 mg/L was used to normalize the test results prior to the calculation of WER values. Aliquots of LABWATER, receiving stream water, Moneta WWTP effluent, and SIMSTREAM were submitted for chemical characterization (see Section 2.6).

A SIMSTREAM sub-stock of cupric sulfate was prepared by diluting 2 ml of the primary copper stock #268 to 500 ml with SIMSTREAM. This provided a sub-stock with a nominal copper concentration of 1.0 mg/L. The test dilutions were prepared by combining the SIMSTREAM sub-stock with un-spiked SIMSTREAM to obtain the following nominal copper concentrations: 21, 32, 49, 75, 116, 179, and 275 µg/L. Acid washed Class 'A' pipettes and cylinders were used to prepare sub-stocks and dilutions.

Table 3: Preparation of SIMSTREAM test dilutions for the Moneta WWTP WER study conducted May 30-June 1, 2013.

Treatment (% SIMSTREAM Sub-stock)	Nominal Copper Concentration (µg/L)	SIMSTREAM Sub-stock Used (ml)	Dilution
Lab. Control	0	0	EPA-236
Receiving Stream	0	0	Hunting Creek
SIMSTREAM	0	0	SIMSTREAM
2.1	21	8.4	To 400 ml with SIMSTREAM
3.2	32	12.8	To 400 ml with SIMSTREAM
4.9	49	19.6	To 400 ml with SIMSTREAM
7.5	75	30	To 400 ml with SIMSTREAM
11.6	116	46.4	To 400 ml with SIMSTREAM
17.9	179	72	To 400 ml with SIMSTREAM
27.5	275	110	To 400 ml with SIMSTREAM

SIMSTREAM test dilutions were prepared by 1015 on May 30, 2013. A 125 ml aliquot of each dilution was preserved with nitric acid for total copper analysis. A separate 125 ml aliquot was filtered at 0.45 µm and preserved with nitric acid for dissolved copper analysis. The remaining solution was used for toxicity testing.

2.6 Analytical Profile of Test Waters

Table 4: Analytical measurements for laboratory dilution water, receiving stream water, Moneta WWTP final effluent, and SIMSTREAM collected May 29, 2013. Full analytical reports including complete metal scans are available in Appendix A.

Parameter	LABWATER	Final Effluent	Receiving Stream	SIMSTREAM
BOD		<2 mg/L*		
Ammonia-N		<0.2 mg/L*		
TKN		2.41 mg/L*		
TOC	<1.0 mg/L	9.6 mg/L	2.0 mg/L	8.6 mg/L
DOC	1.5 mg/L	9.1 mg/L	3.9 mg/L	8.1 mg/L
Specific Conductance	330 µmhos/cm	910 µmhos/cm	128 µmhos/cm	772 µmhos/cm
TSS	<1.0 mg/L	3.9 mg/L*	3.3 mg/L*	3.0 mg/L
Alkalinity	58 mg/L	126 mg/L	47 mg/L	130 mg/L
Hardness	86 mg/L	134 mg/L	57 mg/L	120 mg/L
Total Copper	<1.0 µg/L	25 µg/L	1.3 µg/L	22 µg/L
Dissolved Copper	<1.0 µg/L	22 µg/L	<1.0 µg/L	19 µg/L

* Analyzed at HRSD, Central Environmental Laboratory, Virginia Beach, Virginia

2.7 Toxicity Test Results for Study #1

Test solutions were allowed to equilibrate at least 2 hours prior to test initiation. Each test treatment consisted of 4 test chambers with 5 *C. dubia* each, and one surrogate test chamber with 5 organisms to be used for water chemistry measurements only (D.O., pH, and temperature). The test chambers for the LABWATER test, the SIMSTREAM test, and all surrogates were filled with test solution and randomized on a single test board. The test organisms were introduced into chambers by rows without de-randomizing the chambers. Test organisms were introduced into test solutions at 1250 on May 30, 2013. Test organisms were from the brood designated SC1023, and were born from 1505 on May 29, 2013, to 0900 on May 30, 2013. Test organisms were fed two hours prior to the initiation of the test, but food was not introduced into actual test solutions. Dissolved oxygen, pH, and temperature were measured for each test concentration at test initiation. The test board was placed in Incubator #4 set for a temperature of 25±1°C and a cycle of 16 hours light and 8 hours dark.

At 24 hours, the test board was removed from the incubator. D.O., pH, and temperature were measured in the surrogate chambers for each test concentration. Mortality was recorded, and the test board placed back into the incubator.

The toxicity test was terminated on June 1, 2013, at 1250. Immediately after mortality was recorded, appropriate test solutions were filtered at 0.45 microns and preserved with nitric acid for dissolved copper analysis. The solutions submitted for dissolved copper analysis were all controls, the highest LABWATER and SIMSTREAM test concentrations at which there was no mortality, all test concentrations having partial mortality, and the lowest LABWATER and SIMSTREAM test concentrations having complete mortality. Dissolved oxygen, pH, and temperature were measured for each test concentration at test termination.

Test reports for the LABWATER and both SIMSTREAM tests are available in Appendix A. All water chemistry parameters were within the expected ranges. Temperature remained within 25± 1°C, and D.O. remained above the required 6.0 mg/L. Survival was 100% in the laboratory dilution water controls and un-spiked SIMSTREAM treatment. Table 5 provides a summary of temperature and D.O. measurements taken during the tests. Table 6 provides a summary of the LABWATER test data, and Table 7 provides a summary of the SIMSTREAM test data.

Table 5: Summary of temperature and dissolved oxygen measurements taken during the *C. dubia* tests for the Moneta WWTP WER study conducted May 30-June 1, 2013.

Test	Temperature Range (°C)	Average Temperature (°C)	D.O. Range (mg/L)	Average D.O. (mg/L)
LABWATER	24.1 – 24.9	24.6	7.75 – 8.31	8.05
SIMSTREAM	24.1 – 25.0	24.6	7.69 – 8.33	8.01

Table 6: Summary of toxicity test results and actual metal measurements for the Moneta WWTP LABWATER test with *C. dubia* conducted May 30-June 1, 2013.

Treatment (% LABWATER Sub-stock)	Initial Concentration Copper Total / Dissolved (µg/L)	Final Concentration Copper Dissolved (µg/L)	Mortality at 48 Hours
Lab Control	<1.0 / <1.0	<1.0	0%
0.25	2.8 / 2.5	*	0%
0.39	4.8 / 3.9	2.8	0%
0.60	6.6 / 5.6	4.8	5%
0.91	9.8 / 9.7	7.8	65%
1.4	15 / 13	10	100%
2.1	22 / 20	*	100%

* Analysis of final dissolved copper is not required for this test concentration.

Table 7: Summary of toxicity test results and actual metal measurements for the Moneta WWTP SIMSTREAM test with *C. dubia* conducted May 30-June 1, 2013.

Treatment (% SIMTREAM Sub-stock)	Initial Concentration Copper Total / Dissolved (µg/L)	Final Concentration Copper Dissolved (µg/L)	Mortality at 48 Hours
Lab Control	<1.0 / <1.0	<1.0	0%
Receiving Stream	1.3 / <1.0	<1.0	0%
SIMSTREAM	22 / 19	17	0%
2.1	42 / 36	*	0%
3.2	52 / 45	*	0%
4.9	62 / 69	58	0%
7.5	96 / 84	83	40%
11.6	130 / 110	120	55%
17.9	190 / 160	170	80%
27.5	280 / 240	250	100%

* Analysis of final dissolved copper is not required for this test concentration.

2.8 Final Copper WER Calculation for Study #1

EC50's were determined using measured total and dissolved copper values for test concentrations. The Probit Method (TOXCALC v5.0.23) was used to determine 48-hour EC50 values for the LABWATER and SIMSTREAM tests. A standard hardness of 50 mg/L was used to normalize all EC50 data prior to the calculation of WER values.

The EC50 for total copper in the LABWATER test was 9.061 µg/L. The EC50 was normalized from the reported hardness of 86 mg/L to a standard hardness of 50 mg/L using the published slope for copper of 0.9422, (EPA 2002). The normalized value became 5.436 µg/L total copper. The EC50 value for dissolved copper was 8.514 µg/L, and was normalized to 5.108 µg/L.

The EC50 for total copper in the SIMSTREAM test was 122.8 µg/L. The EC50 was normalized from the reported hardness of 120 mg/L to a standard hardness of 50 mg/L using the published slope for copper of 0.9422, (EPA 2002). The normalized value became 53.82 µg/L total copper. The EC50 value for dissolved copper was 107.7 µg/L, and was normalized to 47.20 µg/L.

The Streamlined Procedure requires that the WER be calculated by dividing the SIMSTREAM LC50 by the greater of either the LABWATER LC50 or the published SMAV (species mean acute value). For *C. dubia*, the SMAV for total copper at a hardness of 50 mg/L is 12.49 µg/L, (EPA 2001). The SMAV for dissolved copper at a hardness of 50 mg/L is 11.51 µg/L (EPA 2001). Since the published SMAV values are greater than the values derived from this study, they were used to calculate the total and dissolved WER values. The total copper WER value for the study conducted May 30, 2013, with *C. dubia*, is 4.309. The dissolved copper WER for the study is 4.101. Table 8 provides a summary of the results.

Table 8: LABWATER and SIMSTREAM copper EC50 values, the associated normalized values, and the calculated copper WER values for the Moneta WWTP study conducted May 30-June 1, 2013, with *Ceriodaphnia dubia*.

	EC50 (µg/L Copper)		EC50 (µg/L Copper) Hardness normalized to 50 mg/L as $CaCO_3$		WER (EC50/SMAV)	
Test	total	dissolved	total	dissolved	total	dissolved
LABWATER	9.061	8.514	5.436	5.108		
SIMSTREAM	122.8	107.7	53.82	47.20	**4.309**	**4.101**

Section 3: Study #2, Water-Effect Ratio Study Conducted August 28-30, 2013

3.1 Sampling Information

On August 27, 2013, a composite sampler was set-up by personnel of the Hampton Roads Sanitation District (HRSD), to collect final effluent at the Moneta WWTP. Teflon tubing was used in the compositors. To collect a field blank, de-ionized water was pumped through the compositing unit and preserved with nitric acid for total copper analysis. The compositor began sampling at 0600 on August 27, 2013, and completed the 8-hour collection period at 1400 on August 27, 2013. The final effluent was poured into 1 gallon containers with all air space removed.

Samples were packed on ice for transport to Shealy Consulting, LLC, in Lexington, South Carolina. A copy of the Chain-of-Custody form which accompanied the samples is available in Appendix B. The samples were received at Shealy Consulting, LLC, August 28, 2013, at 0900. A receipt temperature of 5.3°C was documented. The receiving stream sample was assigned the unique ID#C1285, and the effluent sample was assigned the unique ID# C1286. The samples were stored in a refrigeration unit set between 0 and 4°C. No air space was observed in the effluent sample containers prior to use in testing.

Weather conditions for 14 days prior to sample collection were obtained from monitoring reports for a nearby National Weather Service station KVAMONET1: Smith Mountain Lake @Hales Ford Bridge, in Moneta, Virginia. A summary of the weather conditions is provided in Appendix B.

3.2 Sampling Conditions

Moneta WWTP personnel reported a plant effluent flow of 0.097 MGD for August 27, 2013. The BOD measured in the effluent was <2 mg/L, ammonia-N was <0.2 mg/L, TKN was 1.10 mg/L, and TSS was <1.0 mg/L. All of these parameters were less than the permitted discharge limits, indicating that the treatment plant was operating normally during the sampling event (see Table 9).

The stream flow of the Roanoke River near the discharge area (USGS#02055000) was reported to be 120 cfs. The flow of the Roanoke River was not above average flow during sampling, which indicates that the rivers in the vicinity, including Hunting Creek, were flowing normally and were not impacted by weather events. No visible particulate matter was observed in Hunting Creek during sampling.

Table 9: Town of Moneta WWTP Permit Limits

Measurement	**Effluent Collected August 27, 2013**	**Permitted Monthly Average**	**Permitted Weekly Average**
WWTP Flow	0.037 MGD	--	--
BOD (mg/L)	< 2	7	10
Ammonia-Nitrogen (mg/L)	< 0.2	0.6 (June-Dec.)	0.6 (June-Dec.)
TKN (mg/L)	1.10	5	7.5
TSS (mg/L)	<1.0	30	45

3.3 Copper Source for Study #2

The copper source for Study #2 was cupric sulfate pentahydrate ($CuSO_4*5H_2O$) obtained from Fisher Scientific. The container of cupric sulfate was designated as SHEALY T12-119. A primary copper stock (Stock # 288) was prepared on August 27, 2013, by adding 1.00059 g cupric sulfate pentahydrate to 1 liter de-ionized water in a volumetric flask.

3.4 LABWATER Test Dilutions for Study #2

Laboratory dilution water was prepared on August 26, 2013, and was designated EPA-257. To prepare the dilution water, Town of Lexington drinking water was treated with mixed-bed de-ionizers, UV filtration, an ultra-filtration polishing unit, and a bacterial filter to produce Type I de-ionized water. Dilution water was prepared by adding reagents to the de-ionized water according to the procedure for obtaining moderately hard synthetic dilution water found in Section 7 of EPA 82-R-02-012, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*. This procedure produces water with hardness in the range of 80-100 mg/L as $CaCO_3$.

A LABWATER sub-stock of cupric sulfate was prepared on August 28, 2013, by diluting 2 ml of the primary copper stock to 500 ml with EPA-257. This provided a sub-stock with a nominal copper concentration of 1 mg/L. The test dilutions were prepared by combining the LABWATER sub-stock with un-spiked EPA-257 to obtain the following nominal copper concentrations: 2.5, 3.9, 6.0, 9.1, 14, and 21 µg/L. Acid washed Class 'A' pipettes and cylinders were used to prepare sub-stocks and dilutions.

Table 10: Preparation of LABWATER test dilutions for the Moneta WWTP WER study conducted August 28-30, 2013.

Treatment (% LABWATER Sub-stock)	Nominal Copper Concentration (µg/L)	LABWATER Sub-stock Used (ml)	Dilution
Lab. Control	0	0	To 400 ml with EPA-257
0.25	2.5	1.0	To 400 ml with EPA-257
0.39	3.9	1.6	To 400 ml with EPA-257
0.60	6.0	2.4	To 400 ml with EPA-257
0.91	9.1	3.6	To 400 ml with EPA-257
1.4	14	5.6	To 400 ml with EPA-257
2.1	21	8.4	To 400 ml with EPA-257

Labwater test dilutions were prepared by 0930 on August 28, 2013. A 125 ml aliquot of each dilution was preserved with nitric acid for total copper analysis. A separate 125 ml aliquot was filtered at 0.45 µm using a new Nalgene® analytical filter unit and preserved with nitric acid for dissolved copper analysis. The remaining solution was used for toxicity testing.

3.5 SIMSTREAM Test Dilutions for Study #2

The Streamlined Procedure dictates that Simulated Stream water (SIMSTREAM) must be constructed by combining Moneta WWTP final effluent and upstream receiving stream water at the design low-flow conditions (Instream Waste Concentration, or IWC). The 1Q10 of the receiving stream is 0.082 MGD, and the design flow of the Moneta WWTP is 0.50 MGD, so the SIMSTREAM water consisted of 85.9% effluent. The hardness value of 50 mg/L was used to normalize the test results prior to the calculation of WER values. Aliquots of LABWATER, receiving stream water, Moneta WWTP effluent, and SIMSTREAM were submitted for chemical characterization (see Section 3.6).

A SIMSTREAM sub-stock of cupric sulfate was prepared by diluting 2 ml of the primary copper stock #288 to 500 ml with SIMSTREAM. This provided a sub-stock with a nominal copper concentration of 1.0 mg/L. The test dilutions were prepared by combining the SIMSTREAM sub-stock with un-spiked SIMSTREAM to obtain the following nominal copper concentrations: 21, 32, 49, 75, 116, 179, and 275 µg/L. Acid washed Class 'A' pipettes and cylinders were used to prepare sub-stocks and dilutions.

Table 11: Preparation of SIMSTREAM test dilutions for the Moneta WWTP WER study conducted August 28-30, 2013.

Treatment (% SIMSTREAM Sub-stock)	Nominal Copper Concentration (µg/L)	SIMSTREAM Sub-stock Used (ml)	Dilution
Lab. Control	0	0	EPA-257
Receiving Stream	0	0	Hunting Creek
SIMSTREAM	0	0	SIMSTREAM
2.1	21	8.4	To 400 ml with SIMSTREAM
3.2	32	12.8	To 400 ml with SIMSTREAM
4.9	49	19.6	To 400 ml with SIMSTREAM
7.5	75	30	To 400 ml with SIMSTREAM
11.6	116	45.4	To 400 ml with SIMSTREAM
17.9	179	71.6	To 400 ml with SIMSTREAM
27.5	275	110	To 400 ml with SIMSTREAM

SIMSTREAM test dilutions were prepared by 1000 on August 28, 2013. A 125 ml aliquot of each dilution was preserved with nitric acid for total copper analysis. A separate 125 ml aliquot was filtered at 0.45 µm using a new Nalgene® analytical filter unit and preserved with nitric acid for dissolved copper analysis. The remaining solution was used for toxicity testing.

3.6 Analytical Profile of Test Waters

Table 12: Analytical measurements for laboratory dilution water and effluent submitted August 28, 2013. Full analytical reports including complete metal scans are available in Appendix B.

Parameter	LABWATER	Final Effluent	Receiving Stream	SIMSTREAM
BOD		< 2 mg/L*		
Ammonia-N		< 0.20 mg/L*		
TKN		1.10 mg/L*		
TOC	<1.0 mg/L	7.0 mg/L	1.8 mg/L	6.4 mg/L
DOC	1.3 mg/L	7.0 mg/L	2.2 mg/L	6.2 mg/L
Specific Conductance	327 µmhos/cm	640 µmhos/cm	132 µmhos/cm	571 µmhos/cm
TSS	<1.0 mg/L	< 1.0 mg/L*	1.7 mg/L*	1.3 mg/L
Alkalinity	58 mg/L	118 mg/L	52 mg/L	112 mg/L
Hardness	89 mg/L	111 mg/L	53 mg/L	96 mg/L
Total Copper	<1.0 µg/L	15 µg/L	1.1 µg/L	13 µg/L
Dissolved Copper	<1.0 µg/L	14 µg/L	<1.0 µg/L	11 µg/L

* Analyzed at HRSD, Central Environmental Laboratory, Virginia Beach, Virginia

3.7 Toxicity Test Results for Study #2

Test solutions were allowed to equilibrate at least 2 hours prior to test initiation. Each test treatment consisted of 4 test chambers with 5 *C. dubia* each, and one surrogate test chamber with 5 organisms to be used for water chemistry measurements only (D.O., pH, and temperature). The test chambers for the LABWATER test, the SIMSTREAM test, and all surrogates were filled with test solution and randomized on a single test board. The test organisms were introduced into chambers by rows without de-randomizing the chambers. Test organisms were introduced into test solutions at 1345 on August 28, 2013. Test organisms were from the brood designated SC1097, and were born between 1555 on August 27, and 0900 on August 28, 2013. Test organisms were fed approximately two hours prior to the initiation of the test, but food was not introduced into actual test solutions. Dissolved oxygen, pH, and temperature were measured for each test concentration at test initiation. The test board was placed in Incubator #2 set for a temperature of 25±1°C and a 16 hour light/8 hour dark cycle.

At 24 hours, the test board was removed from the incubator. D.O., pH, and temperature were recorded in the surrogate chambers for each test concentration. Mortality was recorded, and the test board placed back into the incubator.

The toxicity test was terminated at 1300 on August 30, 2013. Immediately after mortality was recorded, appropriate test solutions were filtered at 0.45 microns and preserved with nitric acid for dissolved copper analysis. The test solutions submitted included all controls, the highest LABWATER and SIMSTREAM test concentrations at which there was no mortality, all test concentrations having partial mortality, and the lowest LABWATER and SIMSTREAM test concentrations having complete mortality. Dissolved oxygen, pH, and temperature were measured for each test concentration at test termination.

Test reports for the LABWATER and both SIMSTREAM tests are available in Appendix B. All water chemistry parameters were within the expected ranges. Temperature remained within 25± 1°C, and D.O. remained above the required 6.0 mg/L. Survival was 100% in the laboratory dilution water controls and un-spiked SIMSTREAM treatment. Table 13 provides a summary of temperature and D.O. measurements taken during the tests. Table 14 provides a summary of the LABWATER test data, and Table 15 provides a summary of the SIMSTREAM test data.

Table 13: Summary of temperature and dissolved oxygen measurements taken during the *C. dubia* tests for the Moneta WWTP WER study August 28-30, 2013.

Test	Temperature Range (°C)	Average Temperature (°C)	D.O. Range (mg/L)	Average D.O. (mg/L)
LABWATER	24.1 – 25.2	24.7	7.88 – 8.77	8.34
SIMSTREAM	24.2 – 24.8	24.5	7.89 – 8.85	8.33

Table 14: Summary of toxicity test results and actual metal measurements for the Moneta WWTP LABWATER test with *C. dubia* conducted August 28-30, 2013.

Treatment (% LABWATER Sub-stock)	Initial Concentration Copper Total / Dissolved (µg/L)	Final Concentration Copper Dissolved (µg/L)	Mortality at 48 Hours
Lab Control	<1.0 / <1.0	<1.0	0%
0.25	2.5 / 2.3	*	0%
0.39	3.7 / 3.6	*	0%
0.60	5.7 / 5.3	4.0	0%
0.91	8.3 / 7.9	6.4	10%
1.4	13 / 12	13	90%
2.1	20 / 19	15	100%

* Analysis of final dissolved copper is not required for this test concentration.

Table 15: Summary of toxicity test results and actual metal measurements for the Moneta WWTP SIMSTREAM test with *C. dubia* conducted August 28-30, 2013.

Treatment (% SIMTREAM Sub-stock)	Initial Concentration Copper Total / Dissolved (µg/L)	Final Concentration Copper Dissolved (µg/L)	Mortality at 48 Hours
Lab Control	<1.0 / <1.0	<1.0	0%
Receiving Stream	1.1 / <1.0	<1.0	5%
SIMSTREAM	13 / 11	11	0%
2.1	34 / 30	30	0%
3.2	44 / 40	39	5%
4.9	60 / 54	51	5%
7.5	87 / 81	79	40%
11.6	120 / 110	110	85%
17.9	180 / 170	150	100%
27.5	260 / 230	*	100%

* Analysis of final dissolved copper is not required for this test concentration.

3.8 Final Copper WER Calculation for Study #2

EC50's were determined using measured total and dissolved copper values as test concentrations. The Probit Method was used (TOXCALC v5.0.23) to determine 48-hour EC50 values for the LABWATER and SIMSTREAM tests. A standard hardness of 50 mg/L was used to normalize the EC50 data prior to the calculation of WER values.

The EC50 for total copper in the LABWATER test was 10.39 µg/L. The EC50 was normalized from the reported hardness of 89 mg/L to a standard hardness of 50 mg/L using the published slope for copper of 0.9422, (EPA 2002). The normalized value became 6.035 µg/L total copper. The EC50 value for dissolved copper was 9.737 µg/L, and was normalized to 5.656 µg/L.

The EC50 for total copper in the SIMSTREAM test was 89.89 µg/L. The EC50 was normalized from the reported hardness of 96 mg/L to a standard hardness of 50 mg/L using the published slope for copper of 0.9422, (EPA 2002). The normalized value became 48.62 µg/L total copper. The EC50 value for dissolved copper was 82.71 µg/L, and was normalized to 44.73 µg/L.

The Streamlined Procedure requires that the WER be calculated by dividing the SIMSTREAM LC50 by the greater of either the LABWATER LC50 or the published SMAV (species mean acute value). For *C. dubia*, the SMAV for total copper at a hardness of 50 mg/L is 12.49 µg/L, (EPA 2001). The SMAV for dissolved copper at a hardness of 50 mg/L is 11.51 µg/L (EPA 2001). Since the published SMAV values are greater than the values derived from this study, they were used to calculate the total and dissolved WER values. The total copper WER value for the study conducted August 28-30, 2013, with *C. dubia,* is 3.893. The dissolved copper WER for the study is 3.886. Table 16 provides a summary of these results.

Table 16: LABWATER and SIMSTREAM copper EC50 values, the associated normalized values, and the calculated copper WER values for the Moneta WWTP study conducted August 28-30, 2013.

	EC50 (µg/L Copper)		EC50 (µg/L Copper) Hardness normalized to 50 mg/L as $CaCO_3$		WER (EC50/SMAV)	
Test	total	dissolved	total	dissolved	total	dissolved
LABWATER	10.39	9.737	6.035	5.656		
SIMSTREAM	89.89	82.71	48.62	44.73	**3.893**	**3.886**

Section 4: FWER Determination for Copper

Table 17: Copper WER values generated for the Moneta WWTP:

Study Date	Total Copper WER	Dissolved Copper WER
May 30, 2013	4.309	4.101
August 28, 2013	3.893	3.886

The Final WER (FWER) is calculated as the geometric mean of all total copper WERs. The geometric mean of the two total WER values is **4.096.**

Section 5: Test Result Comparison

Table 18: Values published in EPA 2001 for copper toxicity to *Ceriodaphnia dubia*. The values listed were generated with *C. dubia* <24 hours old, at static conditions, and using measured copper values.

REFERENCE	HARDNESS USED IN STUDY (MG/L)	EC50 (UG/L)	EC50 NORMALIZED TO HARDNESS OF 25 MG/L
Diamond, W.F. 2000.	78	13.1	4.48
	90	8.88	2.66
	90	10.3	3.08
Tetra Tech. 1998	99	10.1	2.76
	70	14.65	5.55
	74	6.72	2.42
	72	6.59	2.43
Diamond et al. 1997b.	80	6.98	2.33
Neserke, G. 1994.	87.5	11.25	3.46
	80.8	13.17	4.36
	80.8	25.25	8.36
	60	11.25	4.93
	30	4.5	3.79

The values listed in EPA 2001 were included in this summary only if they were generated using three criteria: 1) the *C. dubia* tested were less than 24 hours old, 2) the test was conducted under static conditions, and 3) measured copper values were used to determine EC50s. Using the hardness-normalized values, the average total copper EC50 for the EPA values is 3.89 µg/L. The upper limit using 2 standard deviations is 7.29 µg/L, and the lower limit is 0.49 µg/L.

A copy of the Shealy Consulting reference control chart for copper is included as Appendix C. The control chart includes all copper studies in LABWATER from February 25, 2009, through November 7, 2012. The control chart mean is 2.31 µg/L, with an upper limit of 3.05 µg/L and a lower limit of 1.57 µg/L.

Table 19 provides the *C.dubia* EC50 data from both Moneta WWTP WER studies, the EPA published copper EC50 values, and Shealy Consulting, LLC., copper EC50 data.

Table 19: Comparison of EC50 values generated for *C. dubia* <24 hours old. All studies referenced were generated under static conditions with EC50 values calculated using measured total copper. All EC50 values are normalized to a hardness of 25 mg/L.

Study/Facility	Mean EC50 Value (µg/L)	Range (2SD) (µg/L)
Shealy Consulting, LLC.	2.31	1.57 – 3.05
Values Published in EPA 2001	3.893	0.49-7.29
Moneta WER Study #1	2.279	
Moneta WER Study #2	3.027	

Section 6: Blank Analysis Results

Blanks were collected for copper analysis at various points during the WER studies. All analytical reports for the blanks are in the appendix associated with each study.

For Study#1, the field blank, equipment blanks, filtration blanks, and all laboratory equipment/glassware blanks resulted in copper values of $\leq$ 1 µg/L copper.

For Study#2, the field blank, equipment blanks, filtration blanks, and all laboratory equipment/glassware blanks resulted in copper values of < 1 µg/L copper.

Section 7: References

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